

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

THE SINO-JAPANESE
DEADLOCK

ASIATIC WIVES OF AMERI-
CAN CITIZENS

THE COMMUNISTS IN
CHINA

THE RISE OF MODERN
JAPAN

GENERAL PLAN OF COM-
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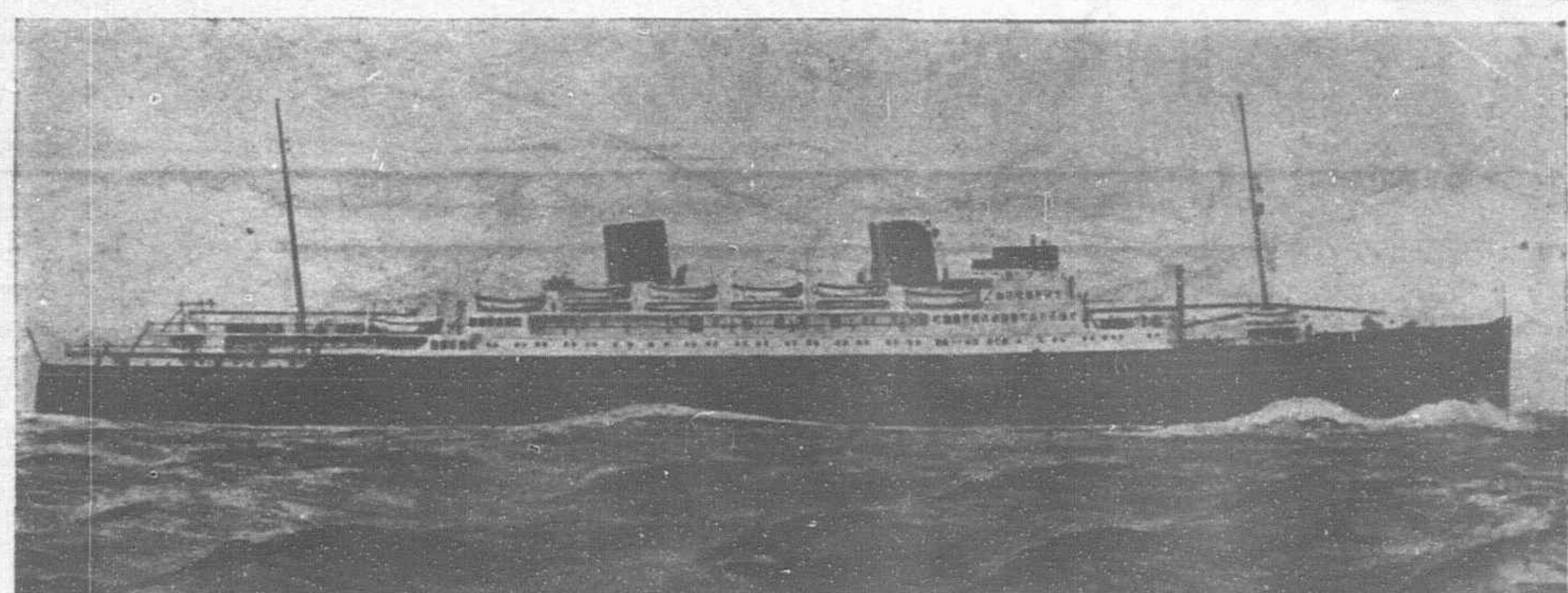
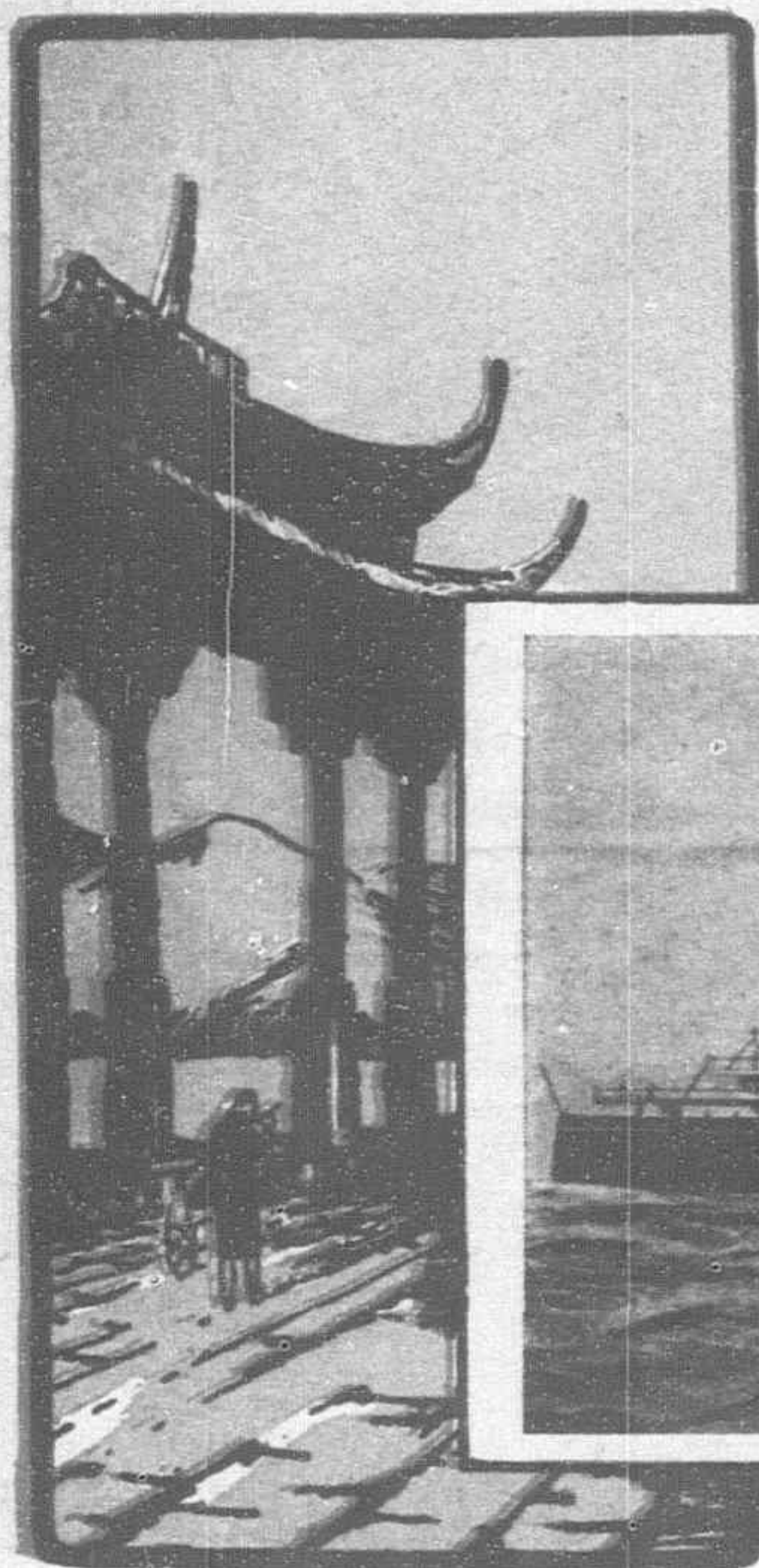
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SHANGHAI, PEKING, TOKYO AND MANILA

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The Far Eastern Review

ENGINEERING

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VOL. XXIV

SHANGHAI, SEPTEMBER, 1928

No. 9

The Sino-Japanese Deadlock

THE deadlock between China and Japan seems to continue to interrupt friendly relations between the two countries. The principal issue involved is the Chinese unilateral abrogation of the Sino-Japanese Treaty of Commerce, the Tsinan Incident, the attitude of Japan toward Manchuria and the anti-Japanese boycott. Any one of these issues would in itself be very grave, but a combination of issues of this nature calls for very great statesmanship on both sides.

To Japan, the unilateral abrogation of the Treaty is the most serious of these issues for it involves the general principle that at the present time when conditions in China are so disordered and when the Government is not in a position to provide an adequately sound form of government which will provide protection to life and property throughout the country, the Chinese desire that Japanese subjects and Japanese property in China should come altogether under their control, a condition which would place Japanese trade at the mercy of politicians who are themselves still uncertain as to the form of government which they will eventually adopt for their country. It will be very difficult for Japan to find any basis of compromise on this issue and Dr. C. T. Wang's tactics in creating this issue, however beneficial they may be to himself in his own political manoeuvres, are ultimately detrimental to his country. China has more to gain by following decent, calm procedure than by sensationalism in the field of diplomacy, particularly when the sensations are not supported by equally sensational improvements in China.

As regards the Manchurian situation, it is to be presumed that sooner or later a *modus vivendi* will be arranged which will prove satisfactory to both China and Japan. Japan's economic position in Manchuria will have to be recognized, but at the same time, China will have to protect the political and territorial integrity of Manchuria. The Manchurian situation hinges upon three factors. First, the general character of the development of the Manchurian railroads. Secondly, the form of government which comes into existence there and thirdly, upon the activities of Soviet Russia in Manchuria.

Under Marshal Chang Hsueh-liang, it would appear that conditions in Manchuria are being stabilized with remarkable rapidity and as the Manchurian Government is as opposed to the ingressions of Soviet Russia as are the Japanese, who must regard Manchuria as the first line of defense in any war between Japan and Soviet Russia, it is more than likely that the Sino-Japanese relations with regard to Manchuria will shortly be stabilized.

With regard to the Tsinan Incident, that would have been settled by now had Dr. C. T. Wang not taken the step of a unilateral abrogation of the Sino-Japanese Treaty. As a matter of fact, informal negotiations for the liquidation of the Tsinan Incident had already begun between Dr. C. T. Wang and Mr. Yada, the Japanese Consul General in Shanghai, and were continued after Dr. Wang took this action.

As regards the anti-Japanese boycott, there can be no question but that it is affecting very seriously Sino-Japanese business and that the Chinese merchants who deal in Japanese goods are suffering as much as the Japanese merchants here. The principal sufferers on the Japanese side are the small Japanese importers and exporters. The larger ones, who have a variety of commodities to sell, find ways of having their commodities in the market.

Among the Japanese there are those who feel that the issue has closed on fundamentals and that it must reach a conclusion at any cost. Among the Chinese there are those who are of the opinion that Dr. Wang had gone too far and that the economic relations between the two countries are such that they must find a way of living at peace with each other. On the other hand, there are those who feel that the Japanese issue can be used to advantage by isolating Japan diplomatically. The procedure would be to make special concessions to other Powers, which would be to Japan's disadvantage.

There is one particular issue which is liable to have very serious consequences. All Chinese statesmen are intent upon the inauguration of tariff autonomy at the earliest possible date. It is generally feared that Japan is likely to block tariff autonomy because of Dr. Wang's unilateral abrogation of the Sino-Japanese Treaty. In both Tsingtao and Dairen only the conventional 5 per cent. tariff rate is now collected. Surtaxes and luxury taxes are not collected because the Japanese will not pay them and if the Japanese will not pay them, none of the nations enjoying the Most Favored Nation Clauses will pay them. Similarly, should the Nationalist Government announce tariff autonomy, then if the Japanese decline to pay the rates, none of the other nations enjoying the Most Favored Nation Clauses will pay the new rates. This is liable to develop into still another issue between China and Japan and it is one which should be dealt with as early as possible as the more numerous the issues, the more difficult it will be to find a fundamental solution for them on the basis of Sino-Japanese friendship.

The deadlock naturally makes it difficult to discuss these questions because one does not know what those who are immediately handling the problems on either side have in mind.

Asiatic Wives of American Citizens

Congressional Measures to Humanize the American Immigration Laws

TWO measures were introduced in the Senate of the United States in the last session of Congress and one in the House of Representatives which is worthy of the most serious attention of those who are interested in smoother relations between the United States and the people of the East.

These Bills deal with the protection of Asiatic wives of American citizens, who are now to be separated from their families in accordance with the present Immigration Laws of the United States. The exact situation at the present time is as follows:

The Supreme Court held in the case *Chong Chan, et al, v. Nagle*, 268 U. S. 346, that Chinese women, being themselves ineligible to citizenship do not become citizens by marrying American citizens.*

Since these wives are aliens ineligible to citizenship, their admission is forbidden by Section 13 (c), Act of 1924.

The Hon. James J. Davis, Secretary of Labor, under whose control immigration is, has recommended to Congress for legislation to provide admission for women of this class and Bills have been introduced along this line, three of which are quoted herewith:

70TH CONGRESS

1ST SESSION

S. 2271

IN THE SENATE OF THE UNITED STATES

JANUARY 5, 1928

Mr. KING introduced the following bill; which was read twice and referred to the Committee on Immigration.

A BILL

To permit the admission, as non-quota immigrants, of certain alien wives and children of United States citizens.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress*
3 *assembled, That clause (1) of subdivision (c) of section 13*
4 *of the Immigration Act of 1924 is amended to read as*
5 *follows: "(1) is admissible as a non-quota immigrant*
6 *under the provisions of subdivision (a), (b), (d), or (e)*
7 *of section 4 or."*

70TH CONGRESS

1ST SESSION

S. 3442

IN THE SENATE OF THE UNITED STATES

MARCH 1, 1928

Mr. WALSH of Massachusetts introduced the following bill; which was read twice and referred to the Committee on Immigration



Harris & Ewing

Congressman L. C. Dyer

A BILL

To admit to the United States Chinese wives of certain American citizens.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress as-*
3 *sembled, That subdivision (c) of section 13 of the Im-*
4 *migration Act of 1924, approved May 26, 1924, as*
5 *amended, is amended by striking out "or" before*
6 *"(3)," and by in-*
7 *serting after "sec-*
8 *tion 3" the follow-*
9 *ing: "or (4) is the*
10 *Chinese wife of an*
11 *American citizen*
12 *of Chinese extrac-*
13 *tion who is the*
14 *holder of an hon-*
15 *orable discharge*
16 *from the military*
17 *or naval service of*
18 *the United States."*

70TH CONGRESS

1ST SESSION

H. R. 6974

IN THE HOUSE OF REPRESENTATIVES

DECEMBER 12, 1927

Mr. DYER introduced the following bill; which was referred to the Committee on Immigration and Naturalization and ordered to be printed.

A BILL

To permit the admission, as non-quota immigrants, of certain alien wives and children of United States citizens.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress as-*
3 *sembled, That clause (1) of subdivision (c) of section 13*
4 *of the Immigration Act of 1924 is amended to read as*
5 *follows: "(1) is admissible as a non-quota immigrant*
6 *under the provisions of subdivision (a), (b), (d), or (e)*
7 *of section 4 or."*

In the hearing before the Committee on Immigration and Naturalization of the House of Representatives on February 7, 1928, Congressman Dyer, who has always taken a deep interest in Far Eastern affairs, stated the case as follows:

Under section 13, paragraph (c), of the immigration act of 1924, we wish to insert before the letter (b) the subdivision (a) of section 4, which is as follows:

(a) An immigrant who is an unmarried child under 18 years of age, or the wife, of a citizen of the United

*Rev. Stat. 2169; Act of September 22, 1922, c.411, 42 Stat. 1022, p. 351.

States who resides therein at the time of the filing of the petition under section 9.

Let me state it again. All this bill would do would be to include paragraph (a) of section 4 with (b), (d), or (e) of section 4.

In other words, it will read then as follows:

- (c) No alien ineligible to citizenship shall be admitted to the United States unless such alien (1) is admissible as a non-quota immigrant under the provisions of subdivisions (a), (b), or (e) of section 4.

Paragraphs (b), (d), and (e) of section 4 of the act of May 26, 1924, in defining the meaning of that term "non-quota immigrant," reads as follows:

- (b) An immigrant, previously lawfully admitted to the United States, who is returning from a temporary visit abroad;
- (d) An immigrant who continuously for at least two years immediately preceding the time of his application for admission to the United States has been, and who seeks to enter the United States solely for the purpose of, carrying on the vocation of minister of any religious denomination, or professor of a college, academy, seminary, or university; and his wife, and his unmarried children under 18 years of age, if accompanying or following to join him; or
- (e) An immigrant who is a bona fide student at least 15 years of age and who seeks to enter the United States solely for the purpose of study at an accredited school, college, academy, seminary, or university, particularly designated by him and approved by the Secretary of Labor, which shall have agreed to report to the Secretary of Labor the termination of attendance of each immigrant student; and if any such institution of learning fails to make such reports promptly, the approval shall be withdrawn.

Paragraph (a) of section 4 of the act of 1924 was, in my opinion, unintentionally left out from section 13c of that act. This bill has only one purpose, namely, to include that letter (a), which would enable an American-born Chinese to bring his alien wife to the United States from China.

The Chairman: It means more than that, does it not? You mean an American-born person of oriental ancestry, not necessarily Chinese, do you not?

Mr. Dyer: Yes.

Further, in a letter addressed by Congressman L. C. Dyer to this Committee, he states the following:—

"On next Thursday, February 7, at 10.30 o'clock, your committee has consented to hear myself and two or three others in support of the bill H. R. 6974, copy of which I am inclosing.

"As you know, this legislation is necessary due to a decision of the United States Supreme Court in the case of *Chang Chan et al. v John D. Nagle* (268 U.S. 346, 45 Sup. Ct. 540).

"Alien Chinese wives of American citizens were admissible to the United States prior to the 1924 immigration act; therefore H.R. 6974 is not asking for a new right but restoration of a former privilege.

"The Supreme Court has decided that section 13 (c) of the 1924 immigration act excludes the Chinese wives of American citizens and that the remedy lies with Congress.

"Section 4A of the 1924 immigration act takes care of the alien wives belonging to races eligible to citizenship, admitting them as non-quota immigrants. Why shouldn't the American-born Chinese enjoy the same right of bringing into the United States his Chinese wife?

"The scarcity of Chinese females in this country forces the Chinese-American citizens to go to China to seek wives of his own race, intermarriage being inadvisable and prohibited by law in 11 States. After marriage the wife must now be left in China.

"This bill would also, of course, apply to Japanese, but its field of operation among the Japanese would be small, almost negligible, for the reason that the situation with regard to the Japanese is different than with regard to the Chinese. The native-born Japanese in this country are largely children

and are about equally divided as to sex. The 1920 census shows this. This being the case, this class will take care of itself in the matter of marriage. The young Japanese-American born, born under the benign influences of our civilization, reared in our schools, blessed with our institutions, will look to the body of girls of his own race born here, who have had the same advantage as to education and environment that he has had, when he seeks a wife. Brought up among these Japanese girls here, association with the natural affection for those with whom he has been brought up, will lead him to seek a wife here, instead of seeking a wife in Japan whose education, thoughts, and ideas are essentially different to his own. Eventually, the same conditions as referred to above would be obtained in reference to Chinese-American citizens when the birth rate of both sexes becomes equal. But until that time arrives, we must not force the Chinese-American citizen to live a life of celibacy or force him to marry a woman which the law forbids to come to the United States.

"During the discussion of the 1924 immigration bill in the house, it was stated that the alien wives of citizens would be taken care of. The Congress had no intention to exclude the alien Chinese wives of American citizens, but the decision of the Supreme Court, referred to above, makes it clear that we did. The Secretary of Labor, in his 1927 annual report, referring to the fact that an alien Chinese merchant residing in the United States has the right to bring in his Chinese wife, said, 'I am sure it was never intended by the Congress that an alien should be entitled to rights under the immigration laws greater than an American citizen.'

"In the last Congress a similar bill (H.R. 6544) was before your committee. Hearings were had upon it February 16, 1926. Since nothing was done in that Congress the hardships has become more pronounced and acute as the period of separation has increased and three years has elapsed without any relief afforded. I therefore ask that you give favorable consideration to this legislation and thereby put an end to this injustice to a most friendly people."

The situation is something like this. If an American citizen marries a Chinese or Japanese woman and the wife bears children, the children are American citizens and are entitled to all the rights and privileges of American citizens, but the wife—mother is an alien, not eligible for admission into the United States. The wife—mother may come into the United States as a student or a tourist, but she cannot go in for permanent residence. Should the father desire to return to the United States for permanent residence, he must be separated from his wife and his children must be separated from their mother. In the event of the death of the father and the children are minors, the children remain as American citizens under the care of a mother who is a citizen of no country. The whole situation is precarious, unjust, and inhuman.

With regard to aliens of non-Asiatic nationality, the wife and mother would have an opportunity to enter the United States as a non-quota immigrant and to seek naturalization in accordance with the naturalization laws and having become a citizen of the country, after a period of five years, the inhuman separation can be rectified, but in case of women of Asiatic nationality, there is no legal way for the rectification of the relationship and in the event of the American citizen being required to take up permanent residence in the United States, it is inevitable that he should be separated from his wife. There can be no justice in such a law and it violates every moral and ethical code.

It must be difficult for Americans to realize that these unjust Immigration Laws as affecting Asiatics are in themselves even more offensive than political or economic discriminations might be, for they offend the social instincts of at least two and probably more races, who inhabit Asia and who feel that as human beings they are socially, and morally as good as anybody else. Surely an Immigration Law which provides one method of treatment for Bulgarians, Hungarians and Albanians and a less favorable method of treatment for the great peoples of Japan and China is unspeakable.

No matter how we may differ with the Chinese people on the question of their immediate ability to create a form of Government which can offer security to life and property of American citizens dwelling in China, it is neither wisdom nor justice to disregard

(Continued on page 388).

The Communists in China

THE following report is reprinted from *International Press Correspondence* and gives the report of the activity of the Young Communist International by Comrade Schüller at the Sixth World Congress of the Communist International. We have taken from it references with regard to the activities of the Young Communist League of China, which has been and is conducting Communist propaganda in China. It is impossible for non-Communists to vouch for the accuracy of this report or to state with any definiteness whether the figures contained therein are exaggerated, but the fact remains that at this principal meeting of the Communists this report was officially made.

Certain facts are particularly notable. According to the Communists, although the Young Communist League of China is a secondary organization, the number of members is 70,000. We are then to assume that the Communist Party of China is a much larger membership. Secondly, the point is made that in May, 1925, 90 per cent. of the members of this League were students, but that to-day only 22 per cent. of them are students, which means that the workers and peasants are being organized for Communist activity.

Finally, the Communist Party again openly declares its opposition to the Kuomintang, which means that the present Nationalist Government in China inevitably faces an intensified struggle with the Communists, which may or may not develop into an important movement which must be watched with the greatest keenness by students of Chinese politics. In this connection, the fact must be presented that the powerful Chinese Seamen's Union is most bitterly anti-Nationalist and most irreconcilably Communist.

As the Chinese Communist Movement is altogether illegal, it is often difficult to ascertain facts and the document which we give below offers important first-hand information.

"The Young Communist League of China was established in 1920 as the Young Socialist League. Prior to the struggle in Shanghai, May, 1925, it had only 2,900 members, 90 per cent. of them students. In September, 1925, it had 9,000 members, 49 per cent. of them students. In July, 1927, it had 35,000, 38 per cent. of them students.

"One notices an enormous upward development in the membership, a reduction in the percentage of students and an increase in the percentage of workers and peasants. In July, 1927, we had there the so-called Wuhan period when we enjoyed a certain amount of legality on the territory of the Wuhan Government. Of course this explains to a considerable extent the strength of the Young Communist League at that time. But I think that precisely for this reason you will be surprised by the subsequent figures. In July, 1927, we had 35,000 members. When the terrible reaction set in afterwards, our organization decreased, of course, and became strictly illegal. It was reduced to 15,000 members in August, 1927.

"In November, 1927, the organization had again increased its membership to 20,000. In March, 1928—under conditions of very strict illegality—it had 33,000 members (applause). These 33,000 members were entirely outside the Kuangtung Province. In addition to them we have 45,000 members in several regions with revolution Soviet and self-governments, so that on the whole we have over 70,000 members. But even if we deduct the 45,000 members in Kuangtung, the fact that there are 33,000 Young Communists in China under appalling conditions of white terrorism, constitutes a glorious page in the history of the C.I. and Y.C.I. and proves that even under conditions of strict illegality we have splendid opportunities for the capture of the youth not only in capitalist countries but also in the colonies.

"The percentage of students in this membership of 70,000 is only 22 per cent, the overwhelming majority are workers and peasants

"I will give you a short outline of the position which the Y.C.L. of China took up during the Chinese revolution.

"During the Northern Expedition the Y.C.L. fully agreed with the policy of the Party, i.e. support for the Northern Ex-

pedition. But already in the last stage of the Northern Expedition,—you probably remember that this was in the beginning of 1927—the Y.C.L. warned against the errors which were cropping up in the Party and against the mistakes and deviations which made already their appearance in the National Government. When Shanghai was taken by the workers in March, 1927, the Y.C.L. played an important rôle, and displayed great heroism; ditto in the struggle against the traitor Chiang Kai-shek. In Wuhan we notice that the growing differences between the Y.C.L. and the Executive of the Party have become more and more evident.

"When our comrades in the Chinese Y.C.L. saw that the Executive of the Party was more and more inclined to capitulate before the Kuomintang and the bourgeois elements, its representatives and ours warned against the impending treachery, and the Y.C.L. published a declaration to this effect.

"We can say that the Y.C.L., far from having a share in the treacherous policy of the Party Executive and its capitulation at the end of the Wuhan period, did on the contrary its utmost to make the policy of the C.I. prevail. When the C.I. proceeded to remove from the Party Executive and the Party the opportunist elements, the Y.C.L. helped not only politically but also organizationally by contributing new young forces to the Executive and the Party cadres.

"But we must also mention the mistakes made by the Y.C.L. of China. It went subsequently to two extremes: Vanguardism and putschism. By vanguardism we mean the endeavor to take the place of the Party. But we opposed this vigorously and succeeded in liquidating this situation. The same applies to the question of putschism, which was however not a special Y.C.L. error, but rather an error committed by the whole Communist movement in China last winter. This error, too, has been liquidated.

"To sum up, we can say that the Y.C.L. of China is developing favorably: from being a students' movement it has developed into a proletarian movement, from being a small group it had developed into a mass organization, out of various errors and much confusion of ideas it has evolved a truly bolshevik policy.

"Therefore, we can draw a valuable lesson from the Chinese example: for us, as the Communist Youth there is every possibility of forming mass Young Communist Leagues even in the colonies.

"In this connection I would like to deal with the question of the Kuomintang Youth. In 1925 Kuomintang elements proposed to form a Youth organization in the Kuomintang. Our comrades in the Chinese Y.C.L. were opposed to this; they looked upon it as an attempt of the opportunist elements in the Kuomintang at forming an opportunist rival organization against the spread of Communist influence within the Youth movement. When recapitulating to-day this first stage, we can say that it was correct not to form a youth organization in the Kuomintang, because it would not have helped us, it would have become a tool in the hands of the opportunist Kuomintang executive to be used against us, whereas we have now succeeded in developing into a mass organization."

Asiatic Wives of American Citizens

(Continued from page 387).

the fact that the Chinese are a great and potentially powerful people and that their present political disqualifications can only be temporary. For no matter how dark the political question in China may be, the Chinese people are steadily moving forward to modern economic conditions and when they establish themselves on a sound foundation, they will turn to such a problem as a social disqualification, or rather a social discrimination, with vehemence and bitterness.

As for the Japanese people, they have often enough complained of this discrimination and the only outstanding political issue between the United States and Japanese is the inequality of the Immigration Law and the umbrageous position in which a great people find themselves *vis-a-vis* many of the smaller nations.

General Plan of Communications

Rehabilitation—Construction—Betterments

By Wong Peh-chun, Minister of Communications, Nationalist Government

I.—GENERAL REMARKS.

(1) **THE IMPORTANCE OF COMMUNICATIONS.**—That the development of communications is of prime importance, is recognized by all countries in the east as well as west, for the enterprise of communications is the life of the constitution of a nation the standing of which and the livelihood of people being so closely connected. It is upon communications that all politics, military, finance, industry, economics and civilization depend. The nation is handicapped when the transportation schemes are interrupted, but once developed and thoroughly operated all industries will flourish and people prosper.

In spite of the fact that the railroad, telegraph, postal service and navigation, etc. have been organized more than several scores of years ago, they are still in primitive stage. With the exception of postal administration which is comparatively well organized but without progress due to the continuous warfare. There are altogether only 7,000 odd kilometers of railroad already completed, total length of 87,000 miles of telegraph, 50 and odd wireless stations, and 100,000 numbers of telephone. The government navigation has not yet been established, what commercial organizations possess are even not quite 400,000 tons. As to aviation and highway and all other methods of modern transportation have been either passed for introduction but still uncarried out or interrupted amid construction, that no comparison can be made between that of the European, American or Japanese. That the continuation of such state will lead to deterioration beyond imagination, it is the duty of this Ministry to see and exert for improvement and salvation.

(2) **THE STATE OF PRESENT CORRUPTION AND THEIR CAUSES.**—Owing to the heavy burden of foreign loans on one side and the continuous strife of civil warfare on the other, the primitive stage of communications in our country to-day with its weak foundation is on the verge of bankruptcy. Like a good doctor who would first diagnose his patient's case before prescription, the following is a brief classified statement of the present chaotic state and causes:

(a) **LOANS.**—Over \$700,000,000 is the amount of loans borne by the Ministry of Communications up till the end of the 13th year of the Republic of China. As to whether new or temporary loans have been contracted by the ex-Peking Government during the years 14, 15, 16, and 17 are to be investigated. With the exception of three that are guaranteed by the salt revenue and consequently notified by debting nations of their deduction from the salt revenue, even the interest is unpaid when due not to mention the capital.

The sum of \$700,000,000 is not a tremendous loan for the country but considering the distance of not more than 7,000 kilometers of completed lines of railroad and some 80,000 miles of telegraph this amount is startling. In tracing the reason of this backwardness we find the hindrance of communications is due to incessation of civil war, the cause of which began before the years 14 and 15 when

Yuan Shih-kai was in power. Utilizing the loans as an excuse for the construction of railroads he took advantage of it especially when elected president as all expenses were then provided by the administrations of communications. This led to all forms of corruption by individuals seeking personal favor and benefit without the least thought on the general welfare of the enterprise of communications. Worse changes occurred during the days of Anfu Party in power. Headed by Tuan upon the death of Yuan, loans to the total amount of about \$110,000,000 were contracted. The loans were advanced for the construction of various railroads, telegraphs and telephones, but with the exception of Lunghai and Szu-tao lines which used part of the loans for construction not an inch of track has been laid on the other lines. During the Special Customs Conference in the 14th year of the Republic it was proposed by the ex-Peking Ministry of Communications to transfer these loans to the Ministry of Finance which the latter accepted inasmuch as they were not spent for the construction of railroads. To the Ministries of Finance and Foreign Affairs therefore these loans should now be apportioned leaving about \$590,000,000 for the Ministry of Communications which alone will require about \$50,000,000 every year for the return of capital and interest, an amount difficult to meet owing to unsettled condition of the country.

(b) **CIRCULATING CAPITAL.**—All incomes accrued and loans contracted are but to be temporarily kept by the Ministry's treasury or bank for proper expenses such as payment of interest, purchasing materials, extension and repairing works but the ex-Peking Government took it as profit and spent at will. Then followed the military transport and official telegram to be credited on account which, up till the end of the 12th year of the Republic reached the amount of \$40,000,000. The Ministry of Finance drew more than \$62,000,000 cash and the face value of floated loans reached about \$11,000,000. Since the 13th year of the Republic, conditions became worse and together with that credited prior to the 12th year, at least an amount of over \$240,000,000 were credited to this Ministry this way.

(c) **PROPERTY.**—Considerable loss has been suffered by the previous administrations, owing to civil war, as to machinery, works,



Mr. Wong Peh-chun, Minister of Communications

stations and their fixtures, especially rails, sleepers, bridges and telegraph poles. According to the record compiled in the 4th year of the Republic our government railroads possessed 1,140 locomotives, 2,169 passenger cars and 17,524 freight wagons, of which only about half of the numbers are now in good condition and service, the rest being either taken out of Shanhaikwan or out of order. Due to abuse and deterioration the time and labor would cost more than double to put them into proper condition again as would otherwise require.

(d) **ADMINISTRATION AND STAFF.**—The enterprise of communications is of technical nature and only men of specialized training should be employed in order to prevent such occurrences like cessation of telegrams, derail and wreckage of trains for the safeguard of lives and property. Since the interruption of communication by the militarists, there are corruptions too numerous to mention such as employment of own staffs regardless of qualification, embezzlement of funds, violation of regulations, etc. The communication administrations of other countries are all of commercial nature, their expenditure to meet income, but in our country to-day each railroad is splitted into sections, each under different managers without any mutual co-operation at all.

(e) **BUSINESS AND OTHER CONDITIONS.**—Besides the complete interruption of through traffic on the Peking-Hankow line for the last two years and other lines at various periods, the pile of untransported goods, absence of passenger service and whatever incomes of the railroad monopolized by the militarists leaving even not enough for the payment of staffs, there are three chief causes either due to unstrict regulations, lack of inspection or loose administration that led to corruption:

1. The corruption of transport companies their inaccurate report as to value, weight and rates;
2. The rebates and commissions offered by merchants in the purchasing of materials; and
3. Commissions on loans, interest on public funds, and etc.

(3) **PLANS FOR IMPROVEMENT.**—The first step for reorganization will start from the national point of view, the ultimate redemption in the future of national control of all forms of communications for the benefit of the nation's prestige and prosperity of people. The second step will be to afford co-operation by the mass, for monopoly the nature may seem profit are to be on equal basis with service for the benefit of public. Last but not least will be devoted to the abolishment of all customary bad habits formed by lack of competition or public spirit so that renewed energy can be produced.

In carrying out the above plan, owing to limitation of time and finance, steps can be introduced only one by one according to their importance. Three steps will be (A) Improvement of existing enterprises; (B) Plan for improvement and enlargement of enterprises urgently required; and (C) Planning of future enterprises.

II.—OUTLINES OF PLAN ON REHABILITATION OF COMMUNICATIONS.

(A) ATTENDANCE ON EXISTING ORGANIZATIONS.—

(1) Five Steps for Rapid Resumption of Normal Communication.

(a) To distribute standard forms to the different railroad and telegraph administrative offices to investigate and report on conditions of damaged railroad or telegraph lines and scheduled for quick repairs.

(b) To investigate the exact number of locomotives, passenger and freight cars, both good and damaged on the different lines, the condition of traffic, the state of wreckage and their repairing, and to effect a quick return of normal condition the number of work-shops are to be required of their expansion of day and night work.

(c) To abolish, according to regulations, more than one managing director appointed for the convenience of military transportation, or control of the whole line during warfare disregarding commercial transportation.

(d) At places where military operation exist a special military transportation bureau may be appointed by the highest officer in command of the army to co-operate with the managing director as to arrangement of cars. No retention of cars at will, participation of administration affairs, stoppage of commercial transportation, however, will be allowed.

(e) To repair and put into condition in quickest practicable time the Yellow River Bridge on the Tientsin-Pukow Railway which links the north and south.

(2) **Eight Steps for Eliminating Corruption and Effecting Improvement on Present Condition.**

(a) Investigation on damages suffered through military operations:

1. Property, circulating capital, wear and tear of effects, etc.
2. Total amount of difference in income as compared with that of the 11th, 12th, and 13th year.

(b) Liquidation of accounts.—

1. Unpaid interest, unpaid but due interest and capital, unpaid purchasing accounts, staff's salary arrears.
2. Adjustment of improper advancement of funds.
3. To prohibit valueless bonds and bank-notes to be mixed with cash account, and to investigate whether any payment in notes is credited into cash account.
4. To clear traffic accounts rapidly prohibiting undue long detention of huge funds.
5. To investigate the paying and receiving of accounts.

(c) The establishment of Supervising Committee of Finance for the centralization of financial power, appropriation of expenditure, and to look after loans and checking accounts. Under the supervision of this Committee will be a treasury for the safe-keeping of cash; purchasings, loans, and payments of comparative huge amounts should be first passed by the Committee and all other but necessary payments should be either included in the budget or sanctioned by the Minister. (Regulations governing its organization shall be drawn up separately).

(d) The establishment of Supervising Committee of National Purchasing Affairs to centralize purchasings as well as encourage national product and manufacturing. The bulk of purchasing expenditure and the difference in wholesale and retail values, warrant the existence of this Committee who can at the same time not only purchase, compare, investigate and test by the specialist, but also open to nation-wide competition.

The following organizations shall be formed, particulars of which to be drafted accordingly.

1. Committee of Supervising of Purchasing Affairs.
2. Office of Testing Materials.
3. Store Dépôt and Sub-dépôts.
4. Material Yard.

Steps taken for encouragement of national product:

1. All administrations of communication to purchase national product at first choice.
2. To establish experimental office of national communication products and to employ experts to instruct manufacturing and improvement.
3. To establish museum of communication product containing both Chinese and foreign materials for exhibition.
4. To draw up regulations governing awards for national products.

(c) Employment of Staffs.—

Regulations governing the following clauses be drawn up separately.

1. Examination as to their education and experience.
2. Selection and protection of staffs.
3. Merits and demerits.

(f) Methods of better Treatment to Staffs and Laborers.—

1. To put into practice retirement bonus.
2. To regulate commiserate-funds for the deceased.
3. Institution for supplementing education.

(g) Revision of Railroad and Telegraph Tariffs.—

1. To standardize common railroad tariffs, allowing special rates for students and group touring, laborers and the poor and emigrants of specified localities.
2. To standardize freight tariffs and freight classifications.
3. To reduce telegraph rates until after installation of new wires and machinery.

(h) To standardize rules and regulations and use Chinese as official language.

(B) **PLANS FOR THE IMPROVEMENT AND ENLARGEMENT OF EXISTING ENTERPRISES.**

1. Railway Administrations.

a. Pingsuei Railway (Peking-Sueiyuan Railway)

1. Improvements on the works on Suei-pao section. (1) to reconstruct proper steel bridges, (2) to build all stations

buildings, (3) to install various equipments in all stations and (4) to construct the Huangho Wharf.

2. To install the interlocking signals and electrical staff on the whole line of Pingpao (Peping to Pao-ti; As signals and staff are important factors to the operating of traffic this line of a distance of more than 800 kilometers and consisting of 5 branch lines occupying the important location of the trunk lines in the north-west, the new system of the signals and staff should be immediately installed so as to facilitate the means of transportation.
 3. To increase the number of engines and cars to meet requirements.
 4. Enlargement of the workshop at Nankow and repair shops in various car-sheds.
- b. Han-Ping Railway (Kinghan Railway)—
1. To reconstruct the Huangho Bridge. Cast iron system for piers was adapted for the existing Huangho bridge. The foundation was not deep enough and the bearing strength was not very high causing low speed of the traffic and increasing maintenance expenditure each year, and the time of guarantee of the bridge had long ago expired, a proper new bridge should be reconstructed. The design for the new bridge tender by the Anglo-Belgian Union Company costing more than \$10,000,000 was the choice. Owing to the various disturbance of civil affairs, however, the work has not yet been carried out. A committee should now be formed of experts for the construction of Huangho bridge to continue designing and to have the scheme carried out.
 2. To enforce all the bridges of the whole line. Copeer's standard from E-40 to E-45 had been mostly used by all railways, but E-35 was the only adoption of this line. For the benefit of Han-ping line itself and for the convenience of through transportation and inter-changing of engines it would be necessary to have all the bridges reinforced.
 3. To enforce the track of the whole line. Up to now, still three quarters of the whole line are using light rails of 75 lbs. If after the reinforcement of the Huangho bridge and all the other bridges without enforcing the track, difficulty would still be felt and through transportation hindered. Since this line is the longest important trunk line in the country the replacement of heavy rails of 85 lbs. would be essential for the unification of railway system.
 4. Construction of wharves at Hankow.
 5. Purchasing of rolling stocks, including locomotives, passenger and freight cars.
 6. Replacement of old sleepers. Under the previous scheme it had been decided to change into steel ties and the estimate was about 1,670,000 pieces for the whole line, 35,000 pieces of which was first ordered as first lot. Upon the arrival of the said cargo just during the breaking out of the civil war and no delivery has been made. This should be investigated as soon as the whole line is restored to its normal condition.

C. TSINPU RAILWAY—

1. The Ningpu Ferry—As the erection of a bridge would cost too much for the present financial state to bear, plans are under way for the introduction of ferry service by which both passenger and freight cars could be carried over in their original wagons.
2. Purchasing of more rolling stocks.—Since the military operation, engines and cars of this line has suffered greatly. Five trains composing of steel cars had been all commandeered by military leaving the rest poorly damaged. As it is the trunk line connecting north and south and forms principle communication leading the inland to the sea, it is necessary to purchase more cars for urgent needs and to meet the supply to all other lines.

D. PIN-FENG RAILWAY (PEKING-MUKDEN RAILWAY)—

1. Replacement of heavy rails outside the Great Wall. The section from Kinchow to Mukden which has a length of 238 kilometers is still using the light rails of 65 lbs. 85 lbs. rails should be replaced in order to make it uniform and facilitate traffic.
2. Rebuilding the Tientsin Station.

3. Purchasing more rolling stocks including locomotives, passenger and freight cars.

E. LUNG-HAI RAILWAY.—This line passes through Kansu, Shensi, Honan and Kiangsu provinces connecting the big desert in the west and leading to the sea in the east, is the principle trunk line possessing an important character, but owing to the repeated military operations it had suffered heavy damages and destructions. The shortage of the rolling stocks should be amended by new purchase. The unconstructed portion of the line will come under the stipulations of the article for uncompleted lines, and the completed portion to be promptly adjusted.

2. TELEGRAPH, TELEPHONE, AND RADIO.—In order to improve electrical communication and encourage commerce the following betterments are to be introduced :

A. TELEGRAPH—

1. Sounder, instead of Morse with reels for expense saving.
2. Duplex or quadruplex instead of simplex now unused in other countries.

B. TELEPHONE.—

1. Automatic telephones like already installed at Shanghai and Tientsin to replace the old type.
2. Establishment of telephone exchange at telegraph offices to expedite news.
3. Long-distance telephone. (For particulars see Appendix No. 1).

C. WIRELESS STATIONS.—All existing wireless stations throughout the country to adopt "vacuum tube" abolishing all long wave and spark system transmitters as per decision of last year's International Wireless Conference.

3. POSTAL SERVICE.

(a) Extension of mail lines throughout the country.—At present the total length of railway mail lines in the country is only about 23,000 li and that of steamer lines over 90,000 li, while courier lines have a total of over 703,000 li, among which some are day and night services and others are daily, bi-daily or once-in-two or three-days services. They are all served by foot couriers. This costs a large amount while the transmission is rather slow. Now that the construction of public motor car roads is being demanded in various provinces, the postal mail lines may be re-arranged and the public roads made use of. Besides, more mail routes may be established in various provinces and hsien districts, in order to make connections.

(b) To increase the number of postal establishments.—According to latest statistics, the post offices in the whole country give only a total of over 2,560; postal agencies over 9,600; rural box offices 7,000 and rural stations over 22,000. The statistics for 1926 show that the mail matter posted during that year totalled more than 580,000,000. This figure in comparison with the total population of 480,000,000 persons for the whole country, works out approximately at only one letter per person for a whole year, and that one Post Office had to serve 40,000 persons. The postal development at this ratio is rather slow. Besides, there are at present many hsien districts where even 3rd Class Post Offices have not been established. Since the postal service is a government enterprise, it must aim at giving all possible facilities to the public and therefore it is necessary to make strenuous efforts to increase the number of postal establishments in time.

(c) DEVELOPMENT of P.O. SAVINGS BANK.—The P.O. Savings Bank of our country was inaugurated in 1919. According to the statistics for 1927, the P.O. Savings Banks in the whole country total more than 300, depositors more than 50,000 and the amount of deposits more than \$8,000,000.00. These remarkable records have been achieved in less than ten years since its inauguration. But, among the depositors, laborers and farmers are very few; the majority being officials, students and merchants. This shows that the general public are not fully familiar with the object and advantages of the P.O. Savings Bank. If efforts are made to propagate and extend this service, and, at the same time, if a uniform currency is fixed; if the procedure of "Through-deposit in the whole country," i.e., not limiting the deposit and withdrawal of money to one particular place, is introduced according to the practice of various countries; then this service will have the best promise of rapid development.

(d) Bringing up technical postal men.

(e) Improvement of postal staff (high and subordinate classes) treatment.

(4) The total outlay to be incurred for reorganizing and expanding the enterprises as mentioned in Article 1, 2, and 3 amounts to no less than \$100,000,000. This amount should be raised from time to time and with due allowance for deficiency. In raising the required capital, the first thing to do is to put in order the financial matters of the past as well as the present. Along with this come the re-organization of loans and the revision of loan agreements. The procedure is as follows :—

(I). DETERMINE THE FINANCIAL NEEDS OF THE ENTERPRISES TO BE REORGANIZED AND TO MEET THEM THROUGH THE FOLLOWING MEANS :—

- (a) Issue of short-term loans.
- (b) To float public loans for the reorganization of railway and telegraph enterprises.
- (c) To prohibit the appropriation of both railway and telegraph earnings for other purchases. The said earnings after deducting maintenance charges for the two enterprises, should be used entirely to meet the urgent needs of such enterprises. The payments of both principal and interest of matured indebtedness should also be postponed, say for two years through arrangements with creditors concerned.

(II). TO PUT INTO EFFECT SPECIAL ACCOUNTING SYSTEM.—Special accounting system should be enforced so as to guard against misappropriation of funds of the enterprises conducted by the Ministry of Communications. This comes directly from the impossibility of relying upon the public treasury for financial help, and so, the enterprises must take care of themselves, without the special accounting system, earnings of the different enterprises will be mixed up with other government revenues and are most liable to be encroached upon by outsiders, thus leaving no funds for reorganizing and expanding the enterprise and for meeting the obligations of indebtedness. For this reason it is earnestly suggested that revenues from the enterprises should be singled out from other government revenues and be kept in the custody of a separate treasurer. To attain this aim, effective means are to be introduced :

- (a) Codification of special accounting rules and regulations.
- (b) Establishment of a centralized treasury for the safe-keeping and custody of funds for and from the different enterprises.
- (c) Strict supervision as to budget-making and final statements of both receipts and expenditures.
- (d) Guarantee as to the proper use of funds for the intended purposes and bring to a stop any misuse or misappropriation.
- (e) Abolishment of rendering services on account.

(III). REORGANIZATION OF OUTSTANDING INDEBTEDNESS AND REVISION OF LOAN AGREEMENTS.—According to statistical figures, domestic and foreign loans of the different enterprises climbed, in 1914, to a total of \$700,000,000. We must remember that in recent years the domestic loans have been in default and also oftentimes, it has been unable to discharge foreign obligations when due, to the impairment of our credit. In order to amend this situation, a reorganization plan is laid out, containing four processes as given below :—

- (a) Various advances and loans aggregating \$110,000,000 as contracted and taken care of by the Ministry of Finance should be left to the said Ministry for their liquidation.
- (b) As to other railway and telegraph loans, domestic and foreign, secured upon either properties or earnings or both, the arrangement of postponing the principal and interest payments should be solicited for from creditors concerned with the understanding that such payments will be made until after the different enterprises under reorganization are put on their feet again and in good order.
- (c) All the remaining loans are to be classified according to their nature and to be treated accordingly.
- (d) Loans agreements should be made reasonable and on an equal basis. Those impairing our sovereign rights, or aiming at monopolistic control and unreasonable profits, should be revised as soon as possible.

(B) IMPROVEMENT AND ENLARGEMENT OF ENTERPRISES URGENTLY REQUIRED.

I.—Section from Chuchow to Shao-kown on the Canton-Hankow Railway to be completed. Approximately \$60,000,000 will be required.

II.—Section from Chien-tang-kiang to Tsao-o on the Shanghai-Hangchow-Ningpo Railway to be completed. Approximately \$10,000,000 will be required.

III.—Section from Ling-pao to Lanchow on the Lunghai Railway to be extended. Approximately \$90,000,000 will be required.

IV.—Reconstruction of Kwankow section on the Peping-Suei-yuen Railway (No estimate is made as surveying is still in-completed.)

V.—To regulate the national wireless stations and their construction, as follows :—

1. Construction of 78 wireless stations throughout the country divided into four divisions, 25 stations for south-eastern, 28 for north-eastern and 12 for north-west and 11 for south-western divisions respectively.
2. Construction of international wireless station at Shanghai for direct communication with European and American countries, to be completed within two years.
3. Construction of broadcasting stations at the Capital, Shanghai, each provincial capital and large seaports and important cities. (For particulars refer to Appendix No. 2.)
4. Proposed plan for the Government Radio Manufacturing works (Appendix No. 3.)

VI.—Proposed plan for locomotive and car works. (See appendix No. 4.)

VII.—Plan for the establishment of Government aerial service.

1. Construction of international aviation field.
2. Domestic aviation lines. (For particulars see Appendix No. 5.)

VIII.—The taking over of navigation administration by this Ministry through :—

1. Co-operating with Ministries of Foreign Affairs and Finance for minute discussion and arrangement.
2. Drawing up of various navigation rules and regulations.
3. Collect and keep navigation experts.

The above eight items being all urgently needed for immediate action will require about \$200,000,000.

(C) PLANNING OF FUTURE ENTERPRISES.

1.—To regulate the principles on railroads throughout the country, for periodical surveying and construction.

1. Two kinds :—main and branch lines, each main and branch line divided into first and second classes as follows :

- (a) First class mainline—
 1. Direct to sea or large seaport or connected with international railroads.
 2. Over 1,000 kilometers in length.
 3. Passing through important capitals or cities.
- (b) Second class main line—
 1. Direct to seaport or connected with main lines.
 2. Over 500 kilometers in length.
 3. Passing through provincial capitals or large cities.
- (c) First class branch line—
 1. Connected with main lines or direct to seaports.
 2. Over 200 kilometers in length.
 3. Passing through prosperous places.
- (d) Second class branch line—
 1. Passing through distinguished places.
 2. Over 200 kilometers in length. (For further particulars see Appendix No. 6).

2.—Allocation of periodical survey and construction. Estimated to be completed within fifty years, divided into ten periods of five years each. (For particulars see Appendix No. 6).

II.—To regulate the national highway, its periodical survey and construction.

- 1.—Classification and scope of design.
 - (a) National highway.
 - (b) Provincial highway.
 - (c) City highway.
- 2.—Classification of highways—
 - (a) Main lines.
 - (b) Branch lines.

3.—Routes of highways and their distances.

4.—Method of periodical construction.

Estimated to be completed in ten years divided into three years of each of the first two periods with last period of four years.

5.—Standard of budget and method of preparation.

Estimated to require about \$138,750,000 according to budget with an average of \$3,000 for each kilometer as per automobile highway already completed. The amount to be borne by the government for floating of highway bonds.

(For particulars see Appendix No. 7).

III.—Proposed plan for the establishment of iron and steel works. (For particulars see Appendix No. 8).

IV.—Plan for the adjustment of Yangtse-Kiang waterways. Aims:—

1. To promote navigation.

2. To prevent flood.

(For particulars see Appendix No. 9).

V.—Extension and encouragement of ocean navigation.

1.—Establishment of South Sea route, China and Japan.

America and Europe routes according to state of financial standing and importance of requirement.

2.—Award and protection of ocean navigation.

(a) To draw up ocean commercial laws.

(b) Regulations governing navigation awards.

(c) Introduction of marine insurance.

3.—Plan for large ship-building yard and extension of existing yards (For particulars see Appendix No. 10).

III.—CONCLUSION.

In carrying out step by step the adjustments and expansion of the enterprises of communications as outlined above, four points will be worthy of consideration, firstly,—Centralization of authority —To create co-operation free from any outside influence as to traffic, finance and staff, etc., giving the central authority not only in name but also actual power of administration.

Secondly.—Independence of accounting. It is earnestly hoped that from now on the government will refrain from the shifting of communication income and local governors stop from drawing so that a special accounting system working for financial independence may be actually carried out.

Thirdly.—Cancellation or reduction of heavy taxes. Owing to the recent numerous forms of taxes and various taxation bureaux in each province one freight car would have to be taxed several times before allowed to proceed to its destination that the merchants either change their routing or postpone shipments thus affecting directly the revenue of railroad and indirectly the tax receipts of government, that a total abolition or reduction would not only facilitate transportation of goods but also increase tax receipts to the benefit of both the merchant and government.

Fourthly.—Suppression of banditry. That all provincial military commanders and local governors to be held responsible with the co-operation of police to insure public peace and safety of traveling so as to eliminate such outrages like destruction of track or robbery on trains, cutting of telegraph poles or wires, ransacking of mails and pirating ships.

Inasmuch as co-operation of all is needed with union as well as division of labor required more than the sole effort of this Ministry, this proposal is hereby respectfully submitted to the government for approval and to be carried out.

(1).—PROPOSED PLAN FOR THE DEVELOPMENT OF THE NATIONAL LONG-DISTANCE TELEPHONE SERVICE AND ITS ESTIMATED COST.

The long-distance telephone service in China has not gone far in its development, although its need has long been felt throughout the country. This plan is mapped out in a very systematic way, and, if systematically carried out, will serve to meet this need well. The most important items in the plan are (1) the laying out of routes (2) the utilization of telegraph poles and (3) the investigation and repairing of telegraph poles.

The entire cost, in the case of the plan being fully carried out, is estimated at \$10,100,000 approximately.

(2).—PROPOSED PLAN FOR THE ESTABLISHMENT OF THE NATIONAL RADIO COMMUNICATION SYSTEM.

Owing to the extensive area of the Chinese Republic, the plan starts with the division of the whole country into four districts and then goes on with the particular work according to the particular nature of each district. The number of stations to be built, according to the plan, is seventy-seven throughout the whole country, excluding six short-wave radio stations for international use.

(3).—PROPOSED PLAN FOR THE GOVERNMENT RADIO MANUFACTURING WORKS.

This plan lays stress on the manufacturing of broadcasting sets, short-wave transmitting and receiving sets, and other radio supplies for the Government Radio Stations. The installation and running expenses of the undertaking are mixed at \$150,000 and \$1,000,000 respectively.

(4).—PROPOSED PLAN FOR LOCOMOTIVE AND CAR WORKS.

The Railway Statistics of 1915 gives the figure of 1,140 locomotives, 2,169 passenger cars and 17,524 freight cars owned by the Government. According to this figure the Government, in order to ensure efficient service, ought to build sixty locomotives, 150 passenger cars and 1,300 freight cars to take the place of those worn out in use each year. This plan has been worked out to meet this demand.

(5).—PROPOSED PLAN FOR ESTABLISHMENT OF THE GOVERNMENT AERIAL SERVICE.

The plan consists of two main items, namely, the establishment of international aerial stations along China's sea coast and the establishment of domestic aerial stations along its principal trade routes. The routes in question are as follows:

1. Mukden-Canton Line.
2. Peiping-Canton Line.
3. Shanghai-Chengtu Line.
4. Tsingtao-Suchow Line.
5. Antung-Urga Line.

(6).—GENERAL SCHEME FOR THE NATIONAL RAILWAY SYSTEMS.

This scheme has been outlined mainly on the basis of the principles laid down by Dr. Sun Yat-sen and partly on the results of the investigations made by many of the experienced railway engineers. It consists of three main parts as follows:

1. Outline of the scheme.
2. Plan for periodic construction.
3. Description of routes and the approximate estimate of the cost of construction and equipment.

(7).—PROPOSED PLAN FOR THE CONSTRUCTION OF THE NATIONAL HIGHWAYS.

The city of Lanchow, owing to its appropriate locality, is taken as the center for the construction of the National Highways which, according to the plan, are classified into two kinds, one taking Lanchow as center runs in a circular way around the city, while the other passing through Lanchow goes in a straight line.

(8).—PROPOSED PLAN FOR IRON AND STEEL WORKS.

This plan is outlined under four headings as follows:

1. Approximately estimate of productive capacity.
2. General description of works.
3. Appropriate location of works.
4. Approximate estimate of cost.

(9).—GENERAL PLAN FOR THE IMPROVEMENT OF YANGTSE RIVER WATERWAYS.

The main work as described in this plan is to be taken up by two steps in two different periods, namely, the surveying period and the engineering period. In the former the principal part of the work is the surveying of the different sections of the river, while in the latter the constructive engineering work takes place.

(10).—PROPOSED PLAN FOR THE GOVERNMENT SHIPBUILDING WORKS.

This plan gives full particulars for the installation of new ship-building works in the ports of Canton and Hankow, while in Shanghai, Foochow and Taku projects are also made for the improvement and expansion of the works now in existence. The approximate cost for the carrying out of this plan is estimated at \$15,000,000.

The Rise of Modern Japan*

By Juichi Tsushima

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AS is well known, the restoration of political power to the Emperor in 1868 from the Shogunate rule brought about most striking changes in the political, economic and social field, and ushered in a new epoch in the history of the Japanese nation. Japan, at the outset an isolated oriental state, enjoying internal peace for many centuries, has now secured an incontestable position as one of the Great Powers of the world in the short period of a little more than half a century. The rise of modern Japan is so remarkable that nothing similar can be found in the history of nations, but, although her progress has been so marvellous, her voyage has not been so peaceful as might be imagined since she steered her ship into the sea of world intercourse.

It is unnecessary to say how difficult was the rôle she had to play and how untiring were her efforts to secure internal political stability up to the moment when she could establish the modern constitutional system in 1889. Since then she has been forced to weather such severe storms as the Sino-Japanese War in 1894-95, the Russo-Japanese War in 1904-05, and the Great World War in 1914-18. It is an interesting coincidence that these events followed each other at intervals of ten years. Further, the great earthquake in the Kwantō district befell her in 1923, and, when the reconstruction work necessitated by this unprecedented catastrophe was nearly accomplished, another unfortunate event occurred in the shape of the banking crisis in the spring of last year, thus creating still another difficulty for her to surmount. Japan has, however, never deviated from her course of incessant progress, in spite of these troubles, which rather served to stimulate her to further strenuous effort.

It is highly important for observers of Japan not to concentrate their attention on the superficial difficulties which have intermittently confronted her, but rather to watch the tide which is carrying her steadily in the direction of progress and development.

Before entering into any detailed description I shall give a general picture of the rise of modern Japan. The population, one of the basic factors in national development, of Japan proper increased from 34,628,000 in 1877 to 55,963,000 in 1920, and to 61,316,000 in 1927, the average increase of the last seven years being 764,000. Japan has now the largest population among the Great Powers, except the United States. National education is so widespread that more than 11 million students (about 19 per cent. of the total population) are being educated in well-organized schools totalling 50,000, and ranging from elementary schools up to universities. Although accurate statistics are not available, Japan is said to be the State with the least number of illiterate people. Since the Parliamentary system was first introduced in 1889 the electorate has been constantly expanding, keeping pace with the development of the time until 1925, when the system of manhood suffrage was established, resulting in an increase in the number of voters from 3,288,000 to 12,406,000. It is gratifying to note that, at the first general election under the new system, which took place in March last, more than 80 per cent. of the voters went to the poll. In short, in politics, science, arts, as well as social welfare, Japan has succeeded in assimilating the essence of the Western civilization with marvellous rapidity while preserving her own characteristics and national spirit. The most significant feature worthy of mention here, however, is the economic progress she has achieved. While agriculture has undergone a great improvement and the mining industry has shown marked development, she had transformed herself into a great industrial country, home industries being replaced by factory industries, handwork by machines. Many new industries have been started under the encouragement of the Government or by private initiative. Japan now ranks third in the world for the consumption of raw cotton and the production of cotton goods. The country has now been covered with a network of railways and connected with the outer world by fleets of modern liners, which are surpassed in amount of tonnage only by Great

Britain and the United States. The expansion of the foreign trade is one of the most noteworthy phenomena, as it has been multiplied 82 times in the last 50 years, five times in the last 20 years, and more than three times when compared with the pre-war year.

Reviewing the position in detail, I may mention that, as regards the foreign trade of Japan proper, the aggregate total of exports and imports increased from Y.50,769,000 in 1877 to Y.4,171,000,000 in 1927. The exports, which amounted to only Y.23 million in 1877, increased steadily in value, keeping pace with the development of home industries, and rose to Y.632 million in 1913 and Y.2,098 million in 1919, and, after showing some decline as a consequence of post-war depression, again reached the unprecedented figure of Y.2,305 million in 1925. With the sharp rise of the rate of Exchange, the export trade was at one time heavily handicapped, but still reached the total sum of Y.1,922 million in 1927, representing 85.5 times the figure of 50 years ago, and 3.2 times that of the pre-war year.

The imports, on the other hand, rose from a little more than Y.27 million in 1877 to Y.729 million in 1913 and Y.2,173 million in 1919, and reached the record of Y.2,573 million in 1925, largely due to the increase of importation of materials and commodities caused by the earthquake. The total value of the imports for 1927 was Y.2,179 million, 97.5 times that of 50 years ago and three times that of the pre-war year.

The salient feature of Japanese foreign trade may be easily seen in the composition of both exported and imported goods. Out of the total exports of 1926 about 85 per cent. consisted of wholly manufactured goods and semi-manufactured goods, of which the principal products were raw silk and silk tissues, cotton yarns and cotton goods; while out of the total imports more than 56 per cent. consisted of raw materials, such as raw cotton, wool, etc.

As regards production, the number of factories increased from 32,390 in 1909 to 51,906 in 1926, the proportion worked by motor rising during the same period from 9,155 to 41,514. The number of factory workers rose simultaneously from 800,637 to 1,875,195, representing an increase of 134 per cent.

Cotton spinning and weaving occupy the foremost position. The number of cotton spindles increased from 215,000 at the end of 1889 to 2,414,000 at the end of 1913 and to 6,116,000 at the end of 1927, while the production of cotton yarns increased from 67,000 bales to 1,518,000 bales in 1913 and 2,531,000 bales in 1927. The consumption of cotton nearly doubled in volume during the period from 1913 to 1927. Silk spinning and weaving have also made marked progress, the value of the total production of silk fabrics in 1926 being estimated at Y.494 million. No less remarkable is the development in the last few years of the rayon industry, which is now in a position to satisfy nearly all the home demand, though this has enormously increased.

Japan has potential hydro-electric power estimated at a maximum of 14,090,000 h.p. in ordinary times, and is now one of the largest producers of electric power in the world, her generating capacity in operation having risen from 115,000 kilowatts at the end of 1907 to 4,055,000 kilowatts at the end of March, 1928. The total capital invested in this industry is the largest among all Japanese enterprises, the authorized capital amounting to Y.4,652 million at the end of March last. Among other industries which have made remarkable progress, the iron and steel, engineering, chemical and allied industries may be specified.

In regard to shipping, the gross tonnage of Japan's mercantile marine rose from 49,000 tons at the end of 1877 to 1,577,000 tons at the end of 1914 and to 3,708,000 tons at the end of April last. Japan now ranks third amongst the shipping countries of the world. This development has naturally accompanied the increasing contribution of its transport service to Japanese foreign trade, which is proved by the fact that the tonnage of Japanese ships entered during

* "The Statist."

1927 was 32,690,000 tons, representing more than 66 per cent. of the total.

With the expansion of shipping, which caused a demand for new ships, the shipbuilding industry at home has made great progress within the last 30 years in spite of the serious handicaps of inadequate supply of materials and lack of skilled labor. Many dockyards and works have been erected with the most modern equipment and are now capable of building ocean steamers with a displacement of over 20,000 tons.

Since the first railway was laid in 1873 between Tokyo and Yokohama, the permanent way has been extended all over the country. The total mileage of both State and private lines open to traffic in Japan proper at the end of March, 1927, reached 11,163 miles (of which 7,826 miles belong to State lines). The remarkable development in this direction will be clearly seen when the figure of 11,163 miles is compared with 4,237 miles in 1920.

In the sphere of banking the principal institutions may be classified in four categories: Special banks, ordinary banks, savings banks and trust companies.

The special banks, numbering 34 in all at the end of 1927, have been established by special laws with particular objects, some with the power to issue notes, some for Foreign Exchange, and others, again, for making agricultural and industrial loans. Their total amount of paid-up capital and deposits were increased respectively from Y.70 million and Y.95 million at the end of 1900 to Y.414 million and Y.1,475 million at the end of 1927, being multiplied 5.5 times and 15.5 times each.

The authorized capital and deposits of ordinary banks were increased from Y.356 million and Y.436 million respectively at the end of 1900 to Y.2,371 million and Y.8,906 million at the end of 1927; being multiplied 6.6 times and 20.4 times each.

The authorized capital and the savings deposits of the present savings banks increased respectively 2 and 20.4 times in the same period, amounting to Y.97 million and Y.1,001 million at the end of 1927. The savings deposits at the Post Office Savings Bank, which amounted to Y.100,000 only at the end of 1877 and Y.24

million at the end of 1902, have increased by leaps and bounds to Y.1,523 million at the end of 1927, being multiplied 63.5 times in the last 25 years.

Since their first establishment in 1906, the trust companies have made rapid development, and at the end of 1927 the companies were 37 in all, with an aggregate authorized capital of Y.333 million. The trust money and trust properties, other than money entrusted to them, amounted to Y.709 million and Y.248 million respectively.

The Government has taken some steps to bring about banking reforms, and the new law regulating ordinary banks was put into force from the beginning of this year.

Although the economic progress of Japan has been remarkable, it is still in a stage of development, and many problems remain to be solved. The readjustment of the Money market, affected by the recent banking crisis and the removal of the gold embargo, are the pending problems, and the solution of these may be said to be now well in sight, for the Government, in co-operation with financial circles and backed by the nation at large, is doing its utmost to accomplish this.

The vital problem, however, which the Japanese nation will be compelled to solve is how to deal with the growth of population, which necessitates the increase both of food supplies and employment. It may briefly be remarked here that the general opinion of the nation is that the problem may be practically and efficaciously solved by the two established economic policies: One, the further promotion of agriculture by intensifying cultivation and increasing cultivated areas; the other the further industrialization of the country, for which there remains still ample room.

In concluding this article, a few words may be added to make clear one of the most important phases of the rise of modern Japan, apart from the material points above mentioned. It is a noteworthy fact that Japan is second to none in her sincere desire for world peace. Her enthusiastic co-operation in the work of the League of Nations and her wholehearted advocacy with other Powers of the cause of disarmament are faithful manifestations of the true spirit and ideals of modern Japan.

Detailed Trade-Mark Regulations of the Nationalist Government

(Order No. 14)

Translation by N. F. Allman

ARTICLE 1.—In applying for the registration of a trade-mark the applicant shall classify the goods to which the trade-mark is appropriated, according to Article 36 of the present regulations. The application shall be accompanied by 5 facsimiles of the trade-mark and an electrotype of the same. The electrotype may be forwarded within sixty days after the application is submitted.

ARTICLE 2.—If the trade-mark to be registered contains colors, the facsimiles shall show these colors.

ARTICLE 3.—A specimen of the trade-mark shall be drawn on stiff paper, with a pen and ink and the size should not exceed 4 inches by the new standard of measurement (12 kung fen 8 kung li).

ARTICLE 4.—The electrotype shall be of wood, or of metal, or of a moveable type from which impressions can be taken, and should not exceed 4-in. by 4-in. in size, according to the new standard of measurement (12 kung fen 8 kung li), and should not be over 8/10ths of an inch thick. (2 kung fen 5 kung li 6).

ARTICLE 5.—Whenever the Trade-mark Bureau considers it necessary, it may require the applicant for registration of a trade-mark to furnish further explanations, and to furnish additional facsimiles of the trade-mark.

ARTICLE 6.—Whenever an applicant for registration of a trade-mark wishes to obtain the privileges of paragraphs 6 to 8 of Article

2 of the trade-mark law, he shall furnish proof of his rights thereto, and state the facts in his application.

ARTICLE 7.—As respects Article 3 of the trade-mark law, if an applicant has used the mark prior to his application he should furnish proof of use, dates and details of the mark.

ARTICLE 8.—In cases coming under Article 3 of the trade-mark law, when it is necessary for a conference of the several applicants, the trade-mark Bureau will set a convenient time limit during which the applicants must meet and report to the Bureau the results of the conference. If no conference has been held or report made within the designated time the case shall be considered as undetermined.

ARTICLE 9.—If application is made to add a similar trade-mark to one already registered, to form an "associated" trade-mark, the applicant must forward his original certificate of registration. After registration is made as per the foregoing, the original certificate forwarded will be returned when the number of the additional trade-mark has been entered and the certificate stamped by the Trade-mark Bureau.

ARTICLE 10.—When application is made for the registration of the assignment of the rights in a trade-mark, according to paragraph 2 of Article 7 of the Trade-mark law, the application must be endorsed by the original owner. Written evidence shall be submitted showing that the transfer of the business is according to law.

ARTICLE 11.—Whenever, in accordance with paragraph 1 of Article 10 of the trade-mark law, an order is made to change the agent, the agent concerned shall be informed thereof.

ARTICLE 12.—Applications for extension of the period of exclusive use in a trade-mark shall be made three months before the expiration of the existing period, and the original certificate shall accompany the application. If the application is made after the said time an additional fee shall be paid.

ARTICLE 13.—Applicants for the registration of an assignment of the exclusive rights in a trade-mark must furnish written evidence of the transfer of the business to which the trade-mark relates.

ARTICLE 14.—Applicants for registration of assignment of the exclusive right of use in a trade-mark by reason of succession must forward the original certificate of registration and written evidence showing legal succession.

ARTICLE 15.—Whenever the exclusive right of use in a trade-mark is given up, or for some reason is assigned, the applicant and interested party must both indorse and forward with the application the original certificate of registration and documentary evidence of the assignment.

ARTICLE 16.—Should the exclusive right of use in a trade-mark be assigned separately, the applicant must state clearly the classification of goods to which the assignment is appropriated.

ARTICLE 17.—Whenever application is made for the assignment of an "associated trade-mark," the applicant must at the same time make application for the assignment of the other trade-marks.

ARTICLE 18.—Whenever the exclusive rights in a trade-mark are abandoned on account of the suspension of the business to which it relates, the application for cancellation can be made only in the name of the registered owner. In case an owner cancels the registration of part of his trade-mark he must state definitely the goods he has ceased to manufacture.

ARTICLE 19.—The prescribed forms for registration, and for other procedure should each be used for its particular purpose.

ARTICLE 20.—Applications made by an agent in connection with trade-marks must be accompanied by written evidence of the agent's authorization to act. The foregoing does not apply to applications filed by the agent of a corporate body when application is made out in the latter's name.

ARTICLE 21.—An application made by a foreigner in connection with a trade-mark should be accompanied with evidence of his nationality, as well as with proof that he has a genuine factory or business within China. If the applicant is a legal entity under foreign law, proof of applicant's status should be submitted.

ARTICLE 22.—Documentary evidence such as powers of attorney, certificates of nationality, etc., when in a foreign language, shall be presented in translation with originals. In case of opposition, or there are interested parties, all documents relating to trade-marks shall be submitted in duplicate.

ARTICLE 23.—Where matters relating to an application about a trade-mark, or procedure, are contrary to the trade-mark law, or the forms prescribed thereunder, or if the prescribed fees have not been paid, or where the facsimiles or electrotypes are not clear or are incomplete, the Trade-mark Bureau can order that proper changes and corrections be made.

ARTICLE 24.—The periods fixed by the trade-mark law, or by these regulations may be altered by the Trade-mark Bureau on request or on its own motion. Whenever an application for alteration of period is made, if there is opposition or there are interested parties, unless all agree, or there are obvious reasons to the contrary, the alteration or change of period will not be allowed.

ARTICLE 25.—Anyone showing cause under some impeding circumstance in accordance with Article 12 of the trade-mark law shall set out the facts in detail, the time of their arising or ceasing. At the same time the delayed or incompleting procedure shall be made up.

ARTICLE 26.—Changes of name, trade-name, residence, or seals, shall be reported to the Trade-mark Bureau by the applicant or his agent. The same rule applies whenever the owner of a trade-mark without permanent residence, changes his residence or business or when he alters his seals. Applications for change of name or seals shall be accompanied by the necessary evidence.

ARTICLE 27.—Applications, documents and other matter concerning trade-marks shall set forth clearly the name of the trade-mark and name of applicant. If the documents refer to a trade-mark already registered the number thereof shall be given.

ARTICLE 28.—Documents and other articles are deemed to have legal effect as of date they are received by the Trade-mark Bureau.

ARTICLE 29.—The results of an examination, or ruling of the Trade-mark Bureau, and the documents on which based, shall be forwarded to the applicant and interested parties. If the aforesaid fail to reach their destination the Trade-mark Bureau shall publish the same in the "Gazette." Thirty days after such publication the documents, etc. shall be deemed to have been delivered. In connection with agents whose authorization has not been registered, delivery of documents, etc., will be assumed as from the date the Trade-mark Bureau posts the same.

ARTICLE 30.—In forwarding documentary evidence and articles relating to trade-mark, if the applicant indicates that they are to be returned, these documents, etc., will be returned on application within sixty days after decision in the particular case.

ARTICLE 31.—Duplicates of documents made by the Trade-mark Bureau shall be signed and duly authenticated as correct copies of the originals.

ARTICLE 32.—The certificate of registration of a trade-mark shall be on a prescribed form, and to it shall be attached a design of the trade-mark. The certificates shall be issued under the seal of the Trade-mark Bureau.

ARTICLE 33.—Whenever the certificate of the registration of a trade-mark is lost or damaged, the owner of the trade-mark may state the fact, present proof, and apply for a new certificate. On the issuance of a new certificate as stated above, it shall be announced in the "Gazette" that the old certificate is invalid. Whenever a trade-mark registration is declared invalid by the Trade-mark Bureau or the trade-mark is cancelled for any reason, the owner shall return the certificate and announcement thereof shall be made in the "Gazette."

ARTICLE 34.—The fees prescribed for the registration of trade-marks are as follows:

- | | |
|--|---------|
| 1.—For registration of exclusive right or for the extension thereof each | \$40.00 |
| 2.—Assignments—two classes | |
| (a) By legal succession | 10.00 |
| (b) Surrender or assignment to others | 20.00 |
| 3.—Alterations or cancellations of registrations | 2.00 |

For associated trade-marks, the fee is half the above. To the foregoing add an educational fee of 50 per cent.

ARTICLE 35.—Other fees relating to trade-marks prescribed by the trade-mark or by other laws or regulations are as follows:

- | | |
|---|---------------|
| 1.—Application for registration | \$5.00 |
| 2.—Application to change name of original applicant | 5.00 |
| 3.—Request for duplicate of certificate | 3.00 |
| 4.—Application for extension of period of exclusive right to use | 5.00 |
| 5.—Application for extension of period of exclusive right of use after prescribed time therefor | 10.00 |
| 6.—Opposition to the approval of another's trade-mark | 15.00 |
| 7.—Application for hearing or re-hearing | 15.00 |
| 8.—Application for duplicate copy of decision | 3.00 |
| 9.—Application for re-examination | 5.00 |
| 10.—Application for Certified copy of Record | 1.00 |
| 11.—Application for certified copy of design or facsimile | 1.00 to 20.00 |
| 12.—Application for copies of documents 20 cents per 100 characters or fraction thereof | |
| 13.—Application for inspection of documents | .20 |
| 14.—Application to intervene | 5.00 |

In case of associated trade-mark the fees shall be one half in respect of numbers 1, 2, and 4 above.

ARTICLE 36.—Applicants for registration of trade-marks should specify the goods to which the trade-mark is appropriated according to the following list. If the applicant cannot determine the classification, the Trade-mark Bureau will make the classification.

CLASSIFICATIONS.

- Class 1.—Chemicals, drugs, medicinal preparations, medical supplies, gum, resin, phosphorus, lime, mineral water and salt (including medicines of all kinds in the form of pills, powders and unguents, as well as bandages and sponges).
- Class 2.—Dye stuffs, paints and varnishes, and other materials used for dyeing and varnishing purposes.
- Class 3.—Aromatic materials. Perfumery, scents and cosmetics not otherwise classified.
- Class 4.—Soap.
- Class 5.—Materials for removing grease, etc., by washing or brushing, not otherwise classified (including washing powder, toothpowder and other kinds of materials and liquids for this purpose).
- Class 6.—Metals and crude products thereof not otherwise classified (including metallic bars, chains, plates and sheets of silver, quicksilver, mercury and alloys).
- Class 7.—Metal manufactures not otherwise classified (including things made by smelting, casting, carving, hammering, pressing, plaiting).
- Class 8.—Steel and sharp tools (including needles, nails and knives).
- Class 9.—Precious metals or their imitations; lead and nickel, and products thereof or engravings, not otherwise classified (including alloys and gilded articles).
- Class 10.—Pearl, jade, precious stones or imitations, and products or carvings thereof not otherwise classified.
- Class 11.—Minerals.
- Class 12.—Stone or imitation and products thereof, not otherwise classified.
- Class 13.—Lime, clay, earth, sand or mixtures thereof (including cement, plaster of Paris, asphalt, sand, earth and lava).
- Class 14.—Pottery, porcelain, earthenware, brick and tile.
- Class 15.—Glass and manufactures thereof together with enamelled wares not otherwise classified, including enamel and cloisonne.
- Class 16.—Rubber and manufactures thereof.
- Class 17.—Machinery and accessories not otherwise classified (including steam engines, dynamos, wind and water mills, sewing machines, printing presses and fire extinguishers).
- Class 18.—Scientific, medical, surveying, photographic, educational apparatus, etc. (including telegraph, telephone and chemical apparatus, surgical instruments, phonographs, optical lenses and calculating machines).
- Class 19.—Agricultural implements.
- Class 20.—Machinery used for transportation purposes, and accessories.
- Class 21.—Clocks, watches and accessories, etc.
- Class 22.—Musical instruments.
- Class 23.—Arms, sporting guns, fireworks, fire crackers and other explosives.
- Class 24.—Silk worms and cocoons.
- Class 25.—Cotton, grasscloth, hemp, ramie, feathers, wool and coarse manufactures thereof.

- Class 26.—Raw Silk.
- Class 27.—Cotton yarn.
- Class 28.—Woollen yarn.
- Class 29.—Hempen yarn and silk threads, not otherwise classified.
- Class 30.—Silk fabrics.
- Class 31.—Cotton fabrics.
- Class 32.—Woollen fabrics.
- Class 33.—Hempen fabrics.
- Class 34.—Other textiles not belonging to any of the above four classes.
- Class 35.—Silk braids, embroideries, fringes and tassels not otherwise classified.
- Class 36.—Hats, clothes, collars, cuffs, handkerchiefs, buttons and other articles of dress.
- Class 37.—Beds, couches and household furniture not otherwise classified.
- Class 38.—Wines of all kinds, and fermented liquors, and products for causing fermentation.
- Class 39.—Ice, aerated water, fruit juices and cold drinks.
- Class 40.—Sauce condiments, and vinegar.
- Class 41.—Sugar and honey.
- Class 42.—Tea and coffee.
- Class 43.—Cakes and bread.
- Class 44.—Foodstuffs and food preparations, not otherwise classified, including smoked, pickled, preserved and canned foods.
- Class 45.—Milk, its products and imitations thereof.
- Class 46.—Cereals, vegetables, fruits, seeds, flour, starch and by-products (including arrow-root, yeast and frozen bean curd.)
- Class 47.—Tobacco.
- Class 48.—Smoking paraphernalia, including pipes.
- Class 49.—Paper and manufactures thereof (including envelopes, account books, spills, etc.)
- Class 50.—Stationery.
- Class 51.—Skins and hides, and manufactures thereof, not otherwise classified (including worked skins and hides).
- Class 52.—Fuels.
- Class 53.—Matches.
- Class 54.—Oil and wax.
- Class 55.—Fertilizers.
- Class 56.—Bamboo, wood and bark thereof.
- Class 57.—Bamboo, wood rattan, bark and manufactures thereof, not otherwise classified; varnished, painted and variegated.
- Class 58.—Bone, horn, ivory, shell and manufactures thereof or imitations, not otherwise classified.
- Class 59.—Straw and manufactures thereof, not otherwise classified (including rope, matting, straw hats and straw braid).
- Class 60.—Umbrellas, fans, sticks, shoes and accessories.
- Class 61.—Lamps and accessories.
- Class 62.—Brushes and wigs.
- Class 63.—Toys and all articles used for the purpose of amusement or pleasure.
- Class 64.—Maps, pictures, paintings, photographs, books, newspapers and magazines.
- Class 65.—Other articles of merchandise not included in the above classifications.

ARTICLE 37.—This regulation effective from date of promulgation.

(The foregoing regulations are promulgated and published by the Nationalist Government in "Trade-Mark Gazette" No. 1 issued at Nanking, February 15, 1928. p.p., 17-29.)

Osaka to be Modern in all Respects

THE population of Osaka, according to the census taken in October, 1925, was 2,114,804. When Osaka adopted the municipal system in 1889, its total area was 5.89 square miles, but about 40 years later, its area increased to 65.75 square miles, two suburban districts (gun) having been added to the municipal zone on April 1, 1925.

The various public works of the Osaka Municipality affect the whole municipal area and two towns and nine villages in the suburbs, with an aggregate area of 85 square miles and a population of 2,170,000. The city planning zone includes besides the municipality of Osaka, one town and one village in Mishima-gun, five villages in Toyono-gun, one town in Kitakawachi-gun and three villages in Nakakawachi-gun.

This zone was fixed by Article 66 of the Home Office Ordinance promulgated in 1925, and it is divided into three sections for residences, commerce and factories. The height of the buildings, their structure and uses are regulated according to the quarters. The areas of the different sections are fixed as follows:

Residential Sections	34.1%
Business Sections	11.0%
Factory Sections	30.2%
Not fixed yet	34.7%
The total area of these sections is 64,460,000 tsubo.	

Fire Prevention Zones

The fire prevention zones in Osaka were fixed according to the regulations governing the structures in cities, which were issued in 1920. They were fixed by a Home Office Ordinance in July, 1923, and are effective since October of the same year. Nakanoshima and more than a dozen quarters are included in Class A fire prevention zone, and the adjacent quarters are designated as Class B zone. The structures in the zones are governed by the regulations pertaining to fire prevention.

Construction of Roads

The improvement and construction of roads has been a pending question for many years since 1886. In 1919, the plan for the construction of a road 144 feet wide and 14,778 feet long, and 46 other roads was made. The work was started in 1921 with some modifications. Besides, the work of paving 250,000 tsubo of the streets by 67,000 tsubo was proceeding, when the disastrous Kanto earthquake occurred in 1923 and necessitated great changes in the plans.

New Plans Fixed

New plans were accordingly fixed, and their execution was started in 1925 on nine year's program to be completed by 1933.

According to the new plans fixed, the roads to be built are the following:

	Width Ft.	Length Ft.	Number
A boulevard	144	14,778	1
Class A road	96	12,300	1
"	90	71,190	6
"	78	22,374	3
"	72	84,402	16
Class B road	60	11,256	4
"	48	10,650	2
"	42	18,060	9
Total		279,060	42

The construction of bridges was included in the plan of the construction and extension of the roads. The Oebashi and the Yodoyabashi bridges, of 144 feet in width are the largest bridges to be built according to the plan. Eighty-four bridges, including these two bridges, are to be built, their total length being 9,600 feet.

Roads Built

The work is progressing rapidly, and the roads already constructed or to be finished by the end of 1928 are as follows:

(1 KEN IS 6 FEET)

Names of roads	Length (Completed) Ken	Width Ken	Total Length Ken
Nara Kaido-sen	150	10	(150)
Jonan-sen	193	12	875
Sakamachi-sen	896	12	896
Tsuruhashi-sen	1,228	12	(1,228)
Kishu Kaido-sen	511	12	1,228
Kita-Ajikawa-sen	458	8	1,275
Nishi-Yokobori-sen	1,021	13	1,855
Kasugaecho-sen	600	10	(600)
Umeda-Kujo-sen	641	16	2,050
Nagahori-sen	477	15	3,198
Tenjinbashi Nishisuji-sen	421	15	1,440
Midosuji-sen	460	24	2,463
Izuo Jukan-sen	1,140	12	1,140
Izuo-Ichioka-sen	360	12	400
Kitano-sen	548	15	606
Ousaka-sen	490	15	931
Dojima-Juso-sen	282	12	1,324

The bridges already built, or are still in course of construction total 18. They have a width of from 18 feet to 90 feet. The Watanabehashi and the Higobashi, with a width of 90 feet, have been already completed.

Work to be Undertaken

Besides the construction of the roads undertaken by Municipal Office, ten roads of the width of from 48 feet to 90 feet, with a total length of about 123,600 feet, going from the center of the city to the districts newly included in the city limit in 1925, are to be built

by the Osaka Prefectural Office at the cost of Y.28,000,000. One more road of 72 feet in width and 1,548 feet in length at Neyagawa, was added this year to the roads to be built by the Osaka Prefectural Office.

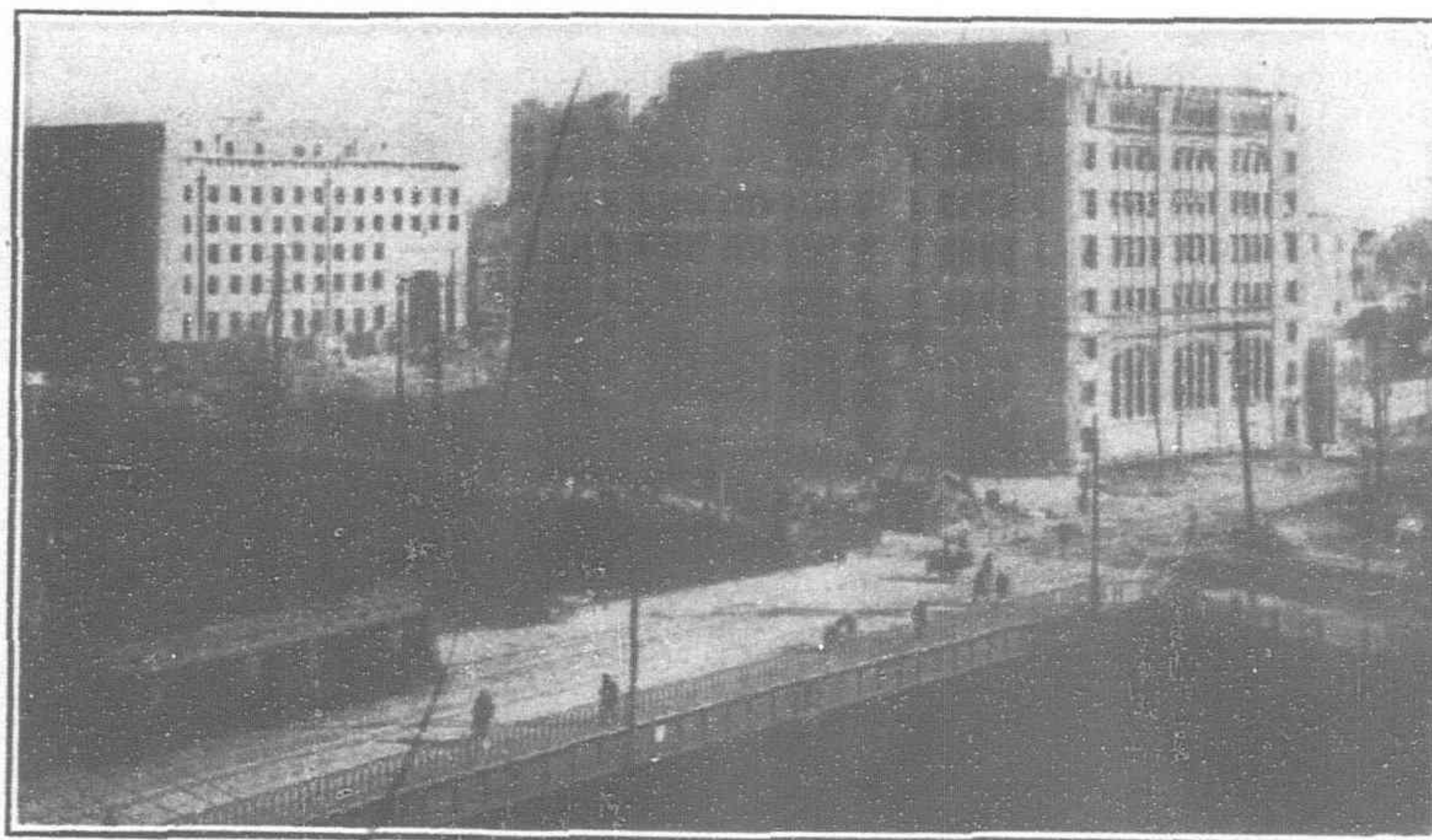
Reconstruction of Bridges

Osaka is noted for its many canals and bridges. But many of the bridges not being proof against earthquake, fire and flood, the Municipality had fixed appropriations for the reconstruction of 82 bridges to be carried out at the same time as the construction of the roads on the 9-year program from 1925.

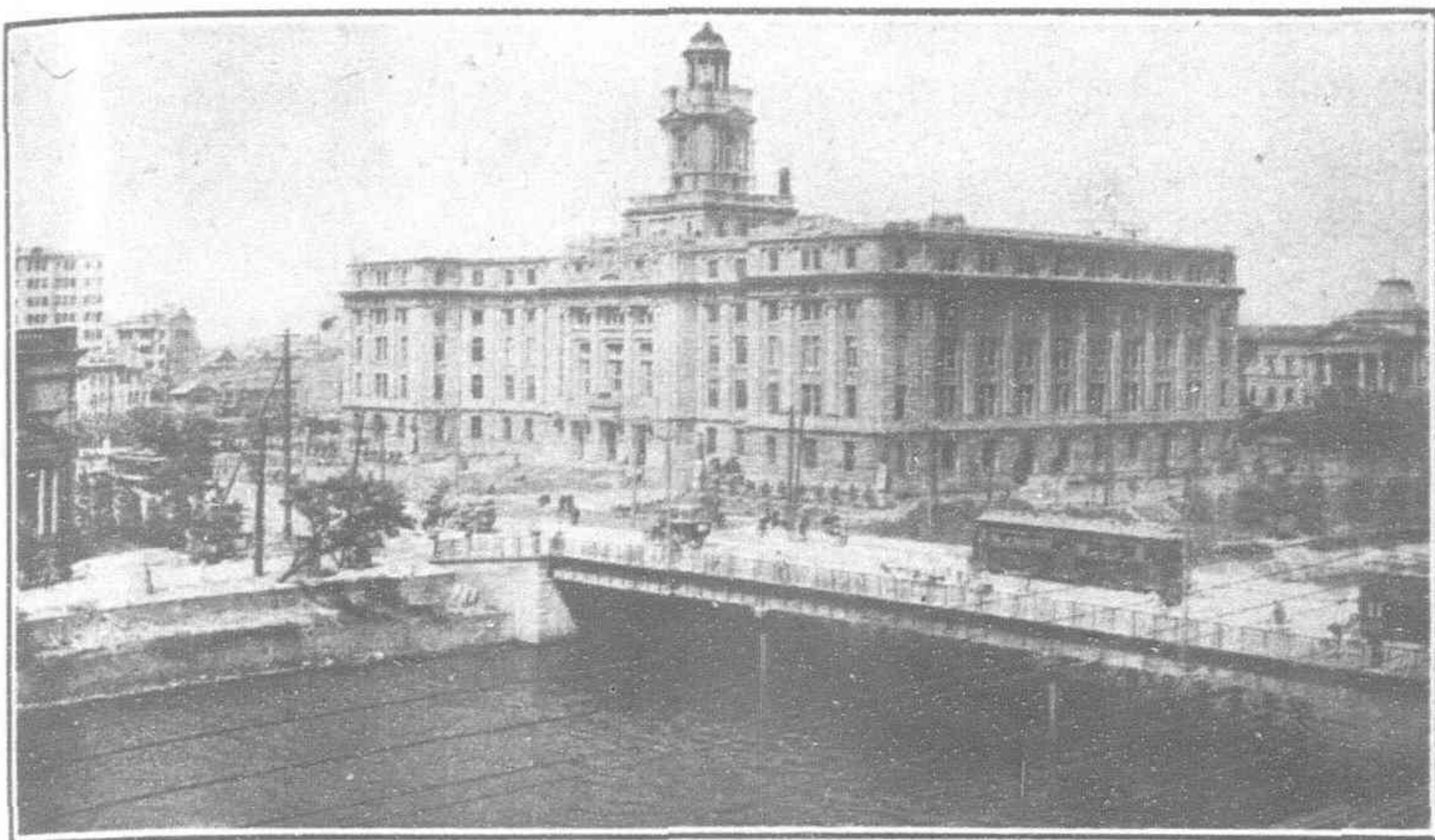
The bridges to be rebuilt are one with a width of 48 feet, two with a width of 37 feet, 39 with a width of 30 feet and 40 with a width of 24 feet. Of these, 27 bridges have been already rebuilt.

Extension of Roads and Paving

The plans fixed in 1919 provided for the extension of the width of the roads by 4.3 ken from east to west and by 3.3 ken from north to south in the old City limits. Many houses had the eaves protrud-



The Kashima and the Sumitomo Buildings



Great View of the City Office at the Nakanoshima, Osaka

Fine View of the Dojima Building—Situated Aside the River
Dojima, Osaka

ing on to the roads, but this was prohibited, and the roads extended accordingly. The readjustment of 270 roads in this respect has been almost completed, and about 67,000 tsubo of land has been recovered.

According to the original plan, 250,000 tsubo of roads was to be paved, but by the modified plan the area to be paved was decreased to 180,000 tsubo. The paving of the new roads is undertaken separately.

Outlay of Y.222,400,000

The total outlay for the construction and improvement of roads and bridges according to the revised plan is Y.222,401,000, excluding the 11 roads to be constructed by the Prefectural Office. Of the sum Y.39,467,000 was already expended by 1924, leaving the balance of Y.182,000,000 for the completion of the work. When the interest on the bonds and other incidental expenses are counted, the expenditure from 1925 until the work is completed will amount to about Y.234,600,000. The outlay will be covered largely by the bond revenues and the special taxes to be paid by the people living along the newly constructed or improved roads.

Other Works

Besides the work already mentioned, the other works to be executed are as follows:

The construction and improvement of the drainage in two periods. The work of the first period has been finished already.

The construction of a high speed railway of 33.86 miles on an 8-year program, at the cost of Y.163,000,000.

The readjustment of 27,770,000 tsubo of land which is to be made the residential quarter. The Municipality is to give aid to 36 corporations owning altogether 9,960,000 tsubo of land, which are to build residential houses.

Next Plans

The public works enumerated above are mostly concerned with the old City limits, and further general plans to be applied to the whole of Greater Osaka are needed. New plans are under consideration, and they will fix the construction and readjustment of roads and bridges, railways, electric railways, canals, parks, squares, athletic grounds, etc., in the districts newly added to the municipal zone.

Large Foreign Trade Passes through Osaka Harbor

Osaka by virtue of its central position in the Japanese Empire and being conveniently situated both as regards water and land transportation has been known as an important place for international and domestic communication in Japan even from days of yore.

The City of Osaka at present has a population of more than 2,100,000, and is thus a great consuming district. Furthermore, there are several large cities and towns in its neighbourhood, the vicinity being most densely populated as it is the industrial center of Japan. The Port of Osaka, the gateway, facilitates distribution and supply of products, cargoes, provisions, and raw materials from and to the industrial hinterland. A glance at the marine traffic statistics for 1926 will throw some light on the scope of trade carried on through the port.

Incoming cargoes, tons 9,269,000, value Y.1,366,000,000; Outgoing cargoes, tons 3,496,000, Value Y.504,000. In tonnage,

the statistics show that there was an excess of imports of about 5,773,000 tons, yet in the value, the figures show that Yen 138,000,000 more worth of goods was exported.

Excess of Imports

The excess of imports over exports in the tonnage is one of the peculiarities of the Port of Osaka which can be seen in all the statistics compiled year after year. This is due to the fact that most of the incoming cargoes consist of provisions and raw materials, whereas the bulk of outgoing cargoes is finished products. This shows that Osaka is a large industrial district.

Of the aforementioned statistics, the amount of foreign and Chosen trade if separated, is as follows:

	Imports Tons	Value Yen	Exports Tons	Value Yen
Chosen	443,927	96,584,000	253,142	97,968,000
Foreign Countries	2,697,232	390,673,000	829,496	556,369,000

As shown in these figures, the Chosen trade of the Port of Osaka has an important significance: imports being mostly rice, soya beans and provisions, while exports chiefly consist of industrial finished products, because Chosen is one of the principal customers in the trade of Osaka.

Next, in the foreign trade, Osaka which carries on its transactions with China, India, South Sea Islands, and North America, naturally exerts a great influence on Oriental trade.

Brief History

Ever since days of old, the port has been regarded as important in Japan but owing to its location, which spreads out westward, the harbor has been exposed to rough seas, and situated as it is at the mouth of a river it finds it hard to keep a proper depth as sand and mud were constantly washed in. These conditions made the port inadequate to meet the demand of changing times. Any one could easily see that unless some thoroughgoing improvement were carried out, the port was bound to become obsolete. This being a vital question to the citizens of Osaka, the port improvement project soon became a public issue. After careful investigations, the city authorities drafted a port improvement plan and decided to make the port a fitting place for ocean liners to call at, equipped with all modern facilities and contrivances.

Gigantic Plan

For this purpose, the city of Osaka launched the gigantic port construction plan in 1897 with a Government subsidy, and constructed a port, after 19 years of continuous work at a cost of Yen 25,000,000. Before the improvement, most of the ocean steamers went to Kobe, and cargoes destined for Osaka were brought by means of sampans and railways. But, as the port construction progressed, the number of vessels calling at Osaka gradually increased, and consequently the port has entirely changed its aspect, thus becoming one of the most up-to-date ports in Japan.

The port construction work, however, was temporarily suspended in 1916, owing to some hitch in connection with the city budget. But as the war boom set in shortly after which brought great prosperity to Osaka, the Port won the supreme position in matters of Oriental trade, and these followed a great influx of cargoes

and vessels into the port. The increase in the volume of trade and number of vessels was so remarkable that the port again found it hard to accommodate all the incoming vessels.

Finally, therefore, in 1918, Osaka resolved to restart the construction work from where it was left off. Immediately, the dredging of the port, construction of docks, building of piers and other port facilities including the reclaiming of land in the neighborhood were speeded up at an expenditure of Yen 15,750,000 with a nine year program bringing up the port to what it is to-day.

No effort is being spared to bring it to a successful conclusion within next year.

Three Projects

Besides the main construction work, the City of Osaka is now undertaking the following three important projects, namely :

(1) Sakurajima Reclamation. In order to provide better facilities to land and sea transportation, the place is to be enlarged to an area of 4,958 acre. (1 acre being 119.6 square yards.)

The present ground is regarded as too small to serve its purpose.

(2) Construction of a mooring quay in front of the reclaimed ground. The quay will be 436 metres when completed.

(3) Building of sheds. Sheds equipped with mechanical contrivances to be built on piers No. 1 and No. 3 which are to be completed within 1928. These sheds to have 12 buildings and will be 291 acres in area.

Outline of Facilities

(1) Depth and Area of the Port, and nature of the soil.

The area which is surrounded by the southern and northern breakwater is 65,455 acres on the surface. The depth is 10.2

metres at low tide, and the principal part for navigation is nine metres deep at low tide The bed is of mud.

(2) Piers and Quays. Futo Daisanbashi (Big Wharf), length 454.55 metres, Depth (at low tide) 9.55 metres. Sakurajima Pier, length 274.73 metres, Depth (at low tide) 9 metres. Tempcsan Pier, length 127.27 metres, Depth (at low tide) 5.91 metres. No. Quay, length 436.36 metres, Depth (at low tide) 10.20 and 9 metres.

(3) Discharging Place. The municipal discharging place and others combined are 1,505 metres in length.

(4) Canal. The Temposan Canal and three others, totalling 7,273 metres in length.

(5) Warehouses and Sheds. Two buildings of municipal warehouse of 45.8 acres in area ; six buildings of the Provision Bureau of the Agriculture and Forestry office of 156.7 acres in area ; 109 buildings of private warehouses of about 930.9 acres in area. Sheds. 13 Municipal Buildings, 275 acres and area. 37 private buildings, 170 acres in area.

(6) Bonded district and Temporary Warehouse. An area of about 533.7 acres in the compound of the wharf and on the pier. In addition, No. 1 municipal shed of 16.6 acres in area is provided as a temporary warehouse.

(7) Quay. Any vessel from 5,000—20,000 tons can be accommodated. Limit 23 vessels.

(8) Water Supply to Vessels. Water supply is operated by the municipality. Twenty-eight sen per ton is charged for direct supply, and 42 sen per ton when delivered.

(9) Cranes. Nine cranes with a lifting capacity of from 1.5 tons to 20 tons. There are three kinds of cranes equipped, namely movable, stationary, and floating.

Asphalt and Related Bitumens in the Philippines

By Leopoldo A. Faustino

NATURAL asphalt and similar products are found in the extreme northwestern peninsular portion of Leyte, in the vicinity of the town of Villaba. The asphaltic material occurs as impregnations of sandstones, limestones, and clay tuffs, which appear to have remained behind after the lighter organic constituents volatilized and migrated upward. It also occurs in distinct fissure veins in clay tuff ; the fissures and cavities apparently were once filled with liquid petroleum, which has subsequently undergone further distillation. The deposit has been variously estimated to contain between 2,000,000 and 10,000,000 metric tons.

Asphalts and bitumens include a wide variety of hydrocarbon materials. These varieties have been given special mineral names, such as gilsonite, grahamite, elaterite, ozokerite, etc. It appears that none of the descriptions of those recognized bitumen minerals can be applied exactly to the various asphalts and bitumens of Leyte. As a matter of fact, the Leyte bitumens are not true asphalts, as all of them are paraffine bearing, and asphalt as commonly defined is derived naturally or artificially from petroleum with an asphaltic base. Table 1* contains data of the physical properties of the three principal varieties of natural bitumens found in Leyte.

TABLE 1.—Physical properties of natural bitumens from Villaba, Leyte.

Property.	A and B.	Outcrop. D.	E, F, and G.
Specific gravity	1.05	1.016	0.98-1.02.
Hardness	2.00	—	1.5.
Color	Jet black	Black	Brownish black.
Streak	Black	—	Light brown.
Luster	Brilliant	—	Dull.
Structure	Columnar	Viscous	Schistose.
Fracture	Conchoidal	—	Irregular schistose.
Flow	Intumescs, softens, and flows imperfectly at 150°C.	at 35°C.	at 75°C.

TABLE 2.—Analyses of bitumens from outcrops E. F. and G, Villaba, Leyte.†

Constituent.	Sample 1. Per cent.	Sample 2. Per cent.
Moisture and loss at 100°C	0.56	2.80
Petrolene	63.45	26.26
Asphaltene	28.59	22.53
Organic nonbitumen	4.68	11.64
Mineral matter	2.88	36.78
Total	100.16	100.01

The Leyte deposit was first worked during the latter part of 1918, by the Leyte Asphalt and Mineral Oil Company. During the three years following, 1919 to 1921, they produced a grade of rock asphalt which was successfully used as road-paving material in Cebu and in other parts of the Philippines. The production was as shown in Table 3.

TABLE 3.—Production of Leyte asphalt, 1919, 1920, and 1921.

Year.	Production. Metric tons.	Value. Pesos.
1919	1,400	21,000
1920	2,000	30,005
1921	766	11,290

In 1920 about 20 tons of the Leyte asphalt were sent as samples to Australia and Japan. It has been reported that the material sent to Japan was used with success on the streets of Tokyo. In 1922 all operations ceased, and soon afterward the controlling interest in the company was purchased by Japanese interests, who had planned to undertake extensive development of the property. The deposit, however, has not been worked since 1921.

According to the Bureau of Customs, the importation of asphaltum into the Philippine Islands in 1924 was 2,421 metric tons valued at 128,691 pesos, while in 1925 it amounted to 1,770 metric tons valued at 97,863 pesos. Table 4 gives the countries of origin of asphaltum imported into the Philippine Islands.

TABLE 4.—Asphaltum imported into the Philippine Islands in 1924 and 1925, by countries of origin.

Country.	1924		1925	
	Metric tons.	Pesos.	Metric tons.	Pesos.
United States	2,418	128,462	1,749	96,556
United Kingdom	1	62	—	—
Great Britain	—	—	1	100
Czechoslovakia	2	150	2	163
Germany	—	17	4	382
Netherlands	—	3	3	156
Mexico	—	—	11	506
Total	2,421	128,691	1,770	97,863

*Pratt, W. E., Petroleum and residual bitumens in Leyte, Philip. Journ. Sci. §A 10 (1915) 262 and 264.

†Analyses by A. H. Wells, chemist, Bureau of Science.

Recent S. M. R. Development Work

THE visitor to South Manchuria, and particularly to Dairen in the Kwantung Leased Territory, is struck by the paternal organization of the South Manchuria Railway, a concern in which the Japanese government holds one-half of the stock. It has constructed, besides the existing roadway of the South Manchuria Railway which extends 438 miles from Dairen to Changchun, the electric light, traction and power works in the Leased Territory, a great general hospital built in Dairen by the American concern of George Fuller Company at a cost of Y.4,500,000 and a wharf at Dairen considered to have the largest loading facilities of any in the Far East. It maintains a Central Laboratory investigating methods of further employment of the economic resources of Manchuria, and several agricultural experiment stations assisting the development of still more valuable crops. It operates the Fushun Collieries at Fushun, and the Anshan Iron Works, and controls the administration of the railway zone, including the provision of educational and welfare institutions.

This civilizing force, as Mr. Henry W. Kinney speaks of it in his recently revised book on "Modern Manchuria and the South Manchuria Railway Company," has in process of building or has recently completed several important construction works. Mr. Kingo Kaise, chief of the Technical Advisory Board of the South Manchuria Railway Company and president of the Engineers' Association of Manchuria, points out certain of these of special interest.

Of these he mentions a coal pier, now being built at Kan-sei-shi, opposite the port of Dairen, which will have a daily loading capacity of 10,000 tons, or over three million tons a year. A breakwater which will protect this pier has been partly completed, and the pier itself is under construction. The mechanical equipment, it is learned from Mr. Kaise, has not yet been purchased, but it is expected that the entire work will be completed and machinery installed and ready for operation by the Spring of 1931.

A second development plan which the South Manchuria Railway has recently completed and now has in progress is the enlargement of the open cut coal mining operations at Fushun. It is expected that the mines, which are 270 miles from Dairen and served by a double track, will be able to take a larger place in the supply of fuel in the Far East, and it is chiefly with this idea in mind that the administration is increasing loading facilities at Dairen.

The seams at Fushun are overlaid by oil shale, and the extent of coal mining there has brought up a problem not only of refilling the open pits, from which a number of underground 'penetrations' have been made through the assistance of pillar supports, but the disposal of this oil shale. The latter, since the earliest operations, have been a source of danger because of the ease and frequency of ignition.

The engineers there have for a number of years been employing the safety device of covering shale with a layer of earth. Fire has, however, been found in shale under a cover of as much as ten feet or more. The fire danger, the need for filling material for pits which have been worked out, and the value of oil have led the Company's Technical Advisory Board to consider and to put into process of realization a plan to extract the oil content for the market and provide a waste product of value in its mining operations.

Mr. Makino, at present charged with a project for the extraction of shale oil, provides figures showing that when plant at present being built has been completed, which is expected to be in September, 1929, the company will be producing 50,000 tons of fuel oil a year, and in addition be securing as bye-products 5,000 tons of coke, 7,000 tons of paraffine, and 18,000 tons of sulphate of ammonia. It is considered that it will eventually be feasible to extract oil to the amount of 4,000 tons a day, and bye-products in proportionate amounts.

The oil shale secured at the Fushun Collieries is a brownish black rock from which it is estimated liquid fuel can be extracted to a total of five thousand million tons. The heat value is believed to average 1,400 calories, and on this basis the heat contained in the shale is equivalent to eleven hundred million tons of coal, greater than the coal of the colliery.

Tests made by the Central Laboratory of the South Manchuria Railway, together with surveys, give the following information:

The thickness of the oil shale strata is 450 feet vertically from the surface, and the real thickness, which runs at right angle to the surface, is 39 feet on the average. The same stratum has an almost equal quality at different points on the same level, but the quality of strata differs considerably at various depths. The upper stratum is the richest, and the lowest, that directly above the coal seam, is the poorest. There are three rich points between.

The standard oil yield (the commercial yield by the Scotch method of distillation estimated by laboratory distillation analyses, averages 5.6 per cent. The highest is 14 per cent. and the lowest 1 per cent. The oil yield will be 7 or 8 per cent. if the poor strata, directly above the coal seam and others, are not worked. It is practicable to collect shales of 10 per cent. oil yield.

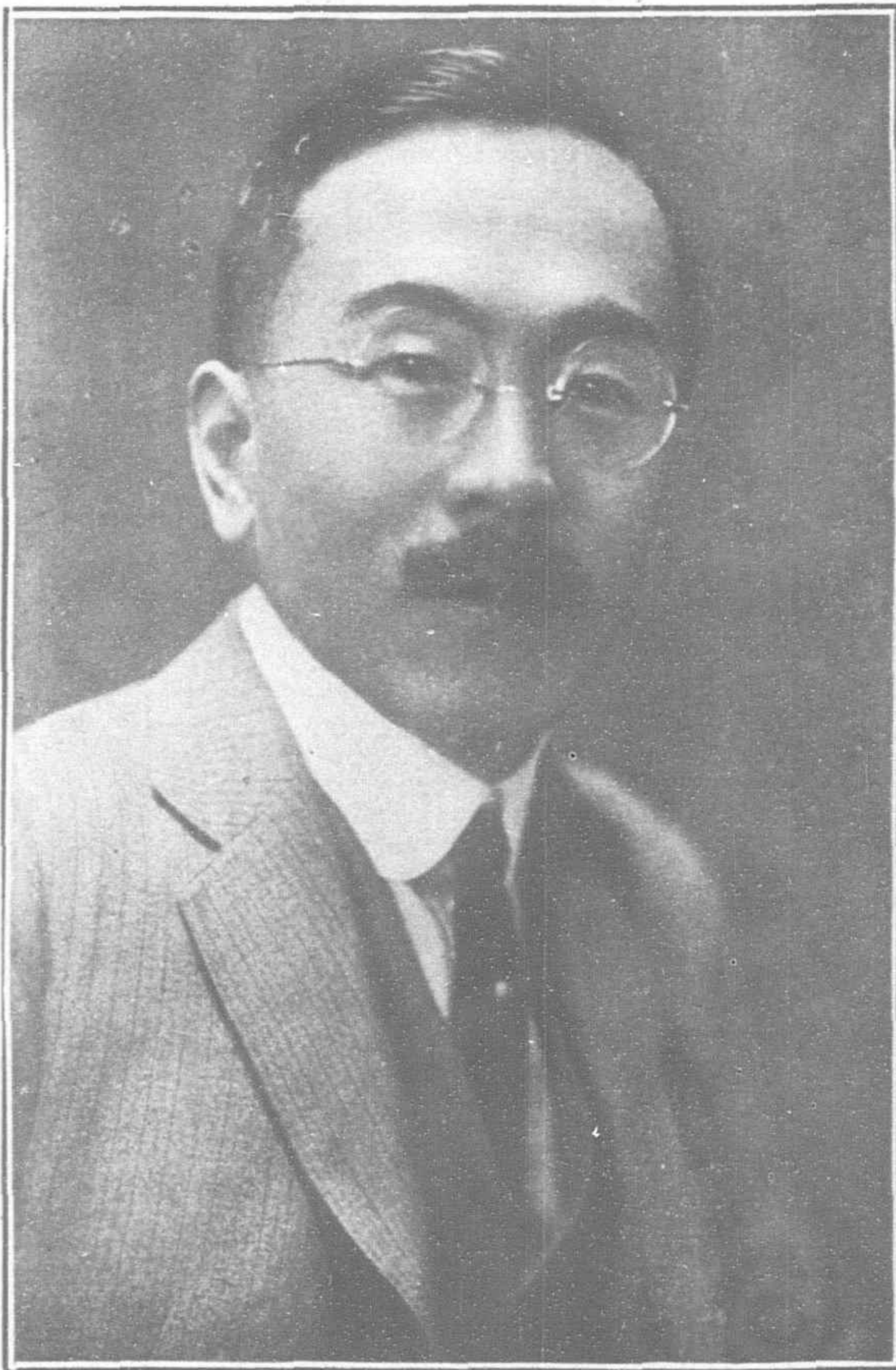
The total amount of oil to be extracted from the shale within the area of the chief open cut is estimated as follows:

If the whole strata is to be treated, the amount of oil obtainable is 53,000,000 tons times 5.6 per cent. (the average oil yield), or 29,680,000 tons. If only the shale of above 8 per cent. oil yield is treated, the amount of oil obtainable is 53,000,000 tons times 20 per cent. times 10 (the average oil yield), or 10,600,000 tons.

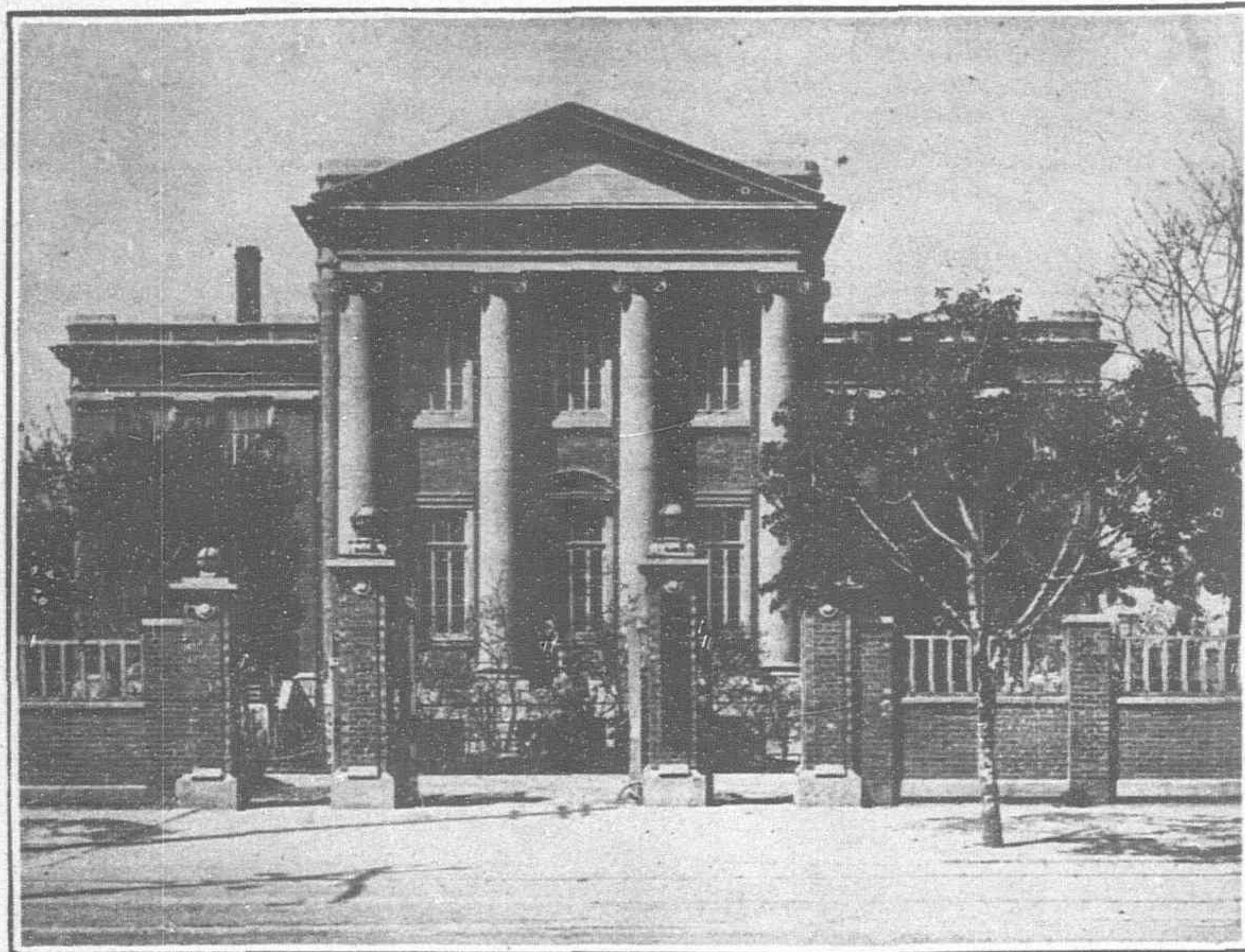
A report by the Central Laboratory some time ago said: "The oil shale only within the area of the great open cut can supply at least 2.5 times the amount the crude oil produced from all of the wells in Japan proper during the next thirty years, and the whole shale strata within the boundary of the Fushun Colliery a similar amount for three hundred years."

The South Manchuria Company has under construction at Mukden a hotel building which when completed will be added to the chain of Yamato hotels, named after a Japanese tribe or clan, which have been constructed at Dairen, Star Beach near Dairen, Port Arthur, Seoul, Korea, and at some other points in parts of the mainland where the Japanese have special interests. These hotels are now being operated by a private holding company organized in January of this year. This separation of going subsidiary concerns from the parent company is in line with a policy which the S. M. R. plans to follow in the future.

A hospital, according to Mr. Kaise, has just been completed at the Fushun Collieries at a cost of Y.500,000 to serve the Chinese



Mr. Kingo Kaise, Chief of the Technical Advisory Board of the South Manchuria Railway and President of the Engineers' Association of Manchuria.



A Library is One of the Many Educational Institutions Which the S. M. R. Has Established in Dairen or in Towns Along Its Railway Zone.

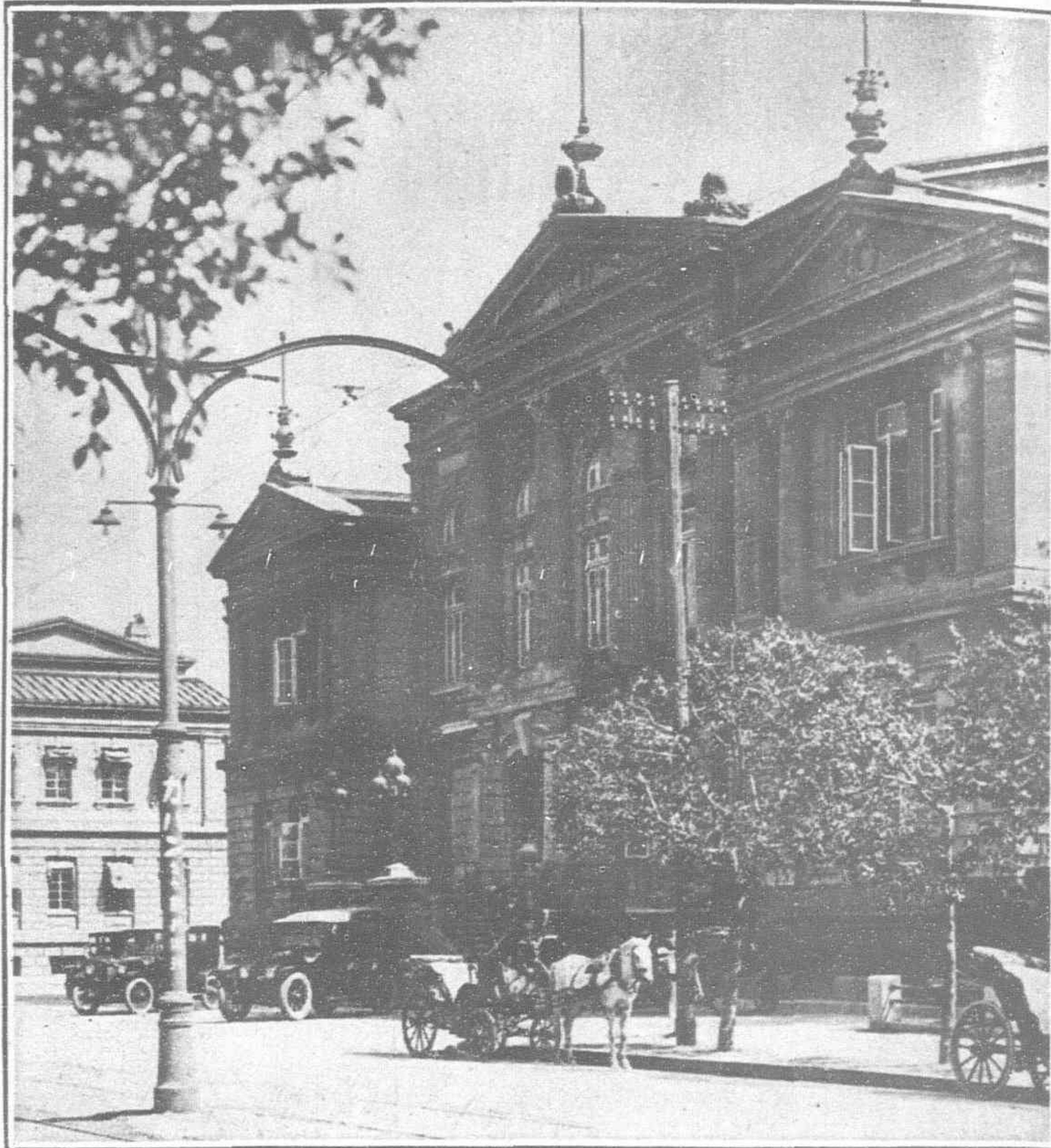
labor employed by the company there, and a general hospital, which will cost Y.1,500,000, is now being constructed at Fushun. The latter is expected to be finished during the present year.

Mr. Kaise also mentions an important and expensive work which the administration has under way in the double tracking of the line from Dairen to Changchun, a distance of 700 kilometers. of this, approximately 500 kilometers have been completed and put into service. This has been an expensive improvement in line which the company has been carrying on already over a period of nearly twenty years. The section from Dairen to the Fushun Collieries was completed rapidly, while the track beyond, serving chiefly an agricultural community, has been allowed a longer time.

One of the parental works of the railway administration, operating through the city government, is the building of an athletic stadium in Dairen for the use of the students of all schools in the city. This stadium, which is of re-enforced concrete and in bowl form, will be completed during the next few weeks and is expected to be available for football and other games during the coming fall.

Mr. Takebe, chief of the Commercial and Industrial Department of the railway administration, is particularly interested in what so far is only a project to prepare in Manchuria soda ash, a chemical especially needed by the Japanese domestic market as a fundamental material in several industries. Japan, according to Mr. Takebe, is at present using 120,000 tons a year, and the demand is steadily increasing. Of this amount, a plant at Makiyama, operated by the Mitsubishi company, is producing 20,000 tons, while nearly all of that imported is supplied by Great Britain.

The chief basis is salt, and it is estimated by Mr. Takebe's department that 300,000 tons of this are being extracted from the sea annually in Manchuria, and that there is the possibility of a much increased production of this easily secured material. Coal, also needed in the manufacturing process, is to be had cheaply in Manchuria.



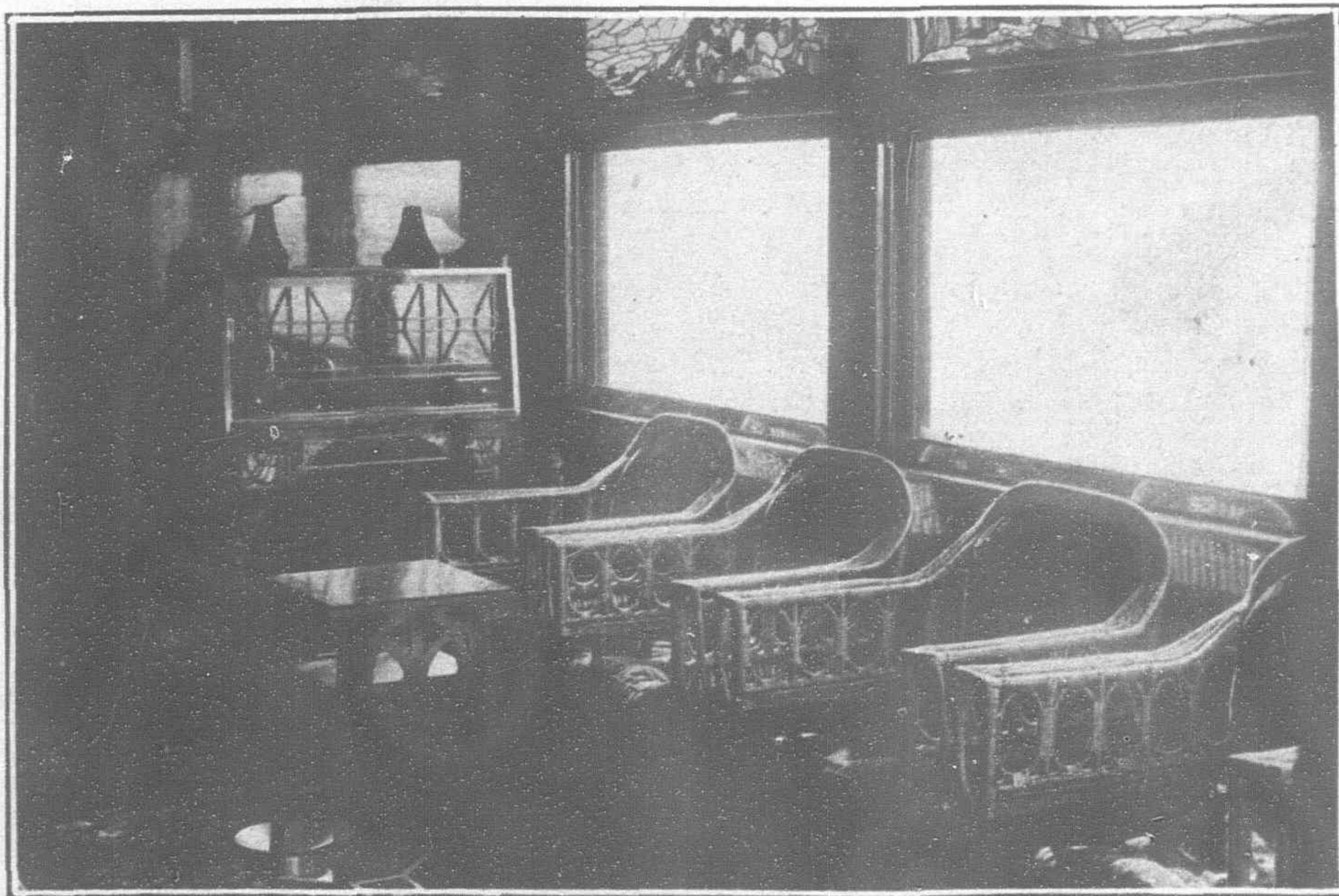
The Administration Building of the South Manchuria Railway Company at Dairen.

A completed plan, for which His Excellency President Yamamoto of the S. M. R. has recently been in Tokyo to secure sanction for putting it into effect is to erect a plant at a cost of Y.5,500,000 which would manufacture 50,000 tons a year, or approximately half of the ash which Japan at present buys abroad. It is believed that it can be manufactured in Manchuria and sold in Japan for less than is at present being paid for imported ash.

While a site for the plant has not yet been selected, it is understood that one in the Kwantung Leased Territory is favored, and it is thought that the point of construction will probably be not far from the important salt fields of Pitsuwo.

In line with its policy of directing so far as possible the lines of development of the Kwantung Leased Territory and South Manchuria rather than controlling it, the railway administration will, in the event that the soda ash plant is constructed, invite participation in the enterprise by other capital.

On this subject one of the company's directors, Mr. Kohiyama, says, according to a recent issue of the "Manchuria Daily News," "This question has long been studied, particularly by Doctor Nishikawa of the Kyushu Imperial University. As we are sure of the economic feasibility of the undertaking, we are prepared to start it. The railway is working jointly with the Kwantung government and home capital, but in the event that others withdraw, the railway administration is prepared to continue on its own account."



An Observation Car Is Part of the Equipment on S. M. R. Express Trains.

The Central Laboratory of the South Manchuria Railway

COMMENT of those acquainted with the large and manifold operations of the various departments and institutions of the South Manchuria Railway Company is that some of the most important work of the entire system so far as concerns planning for economic development is that being done by the administration's Central Laboratory, of which Dr. S. Sera is president and director general. This organization, the central office and head laboratories of which are in Dairen, has a branch at Anshan, where it is operated in connection with the Anshan Iron Works, and an affiliated laboratory at the Fushun Colliery at Fushun, 270 miles north of Dairen.

There are now under the direction of Dr. Sera five departments, these being under the titles of agricultural chemistry, mineral or inorganic chemistry, leather and tanning, organic chemistry, and fats and oils, the latter being concerned with new methods of treating these two most important items in the trade of the area served by the South Manchuria Railway's system.

The existence of these five sections is the result of a reorganization in April, 1927, of two departments which until then had been termed a chemical and a research laboratory. With an increased staff, now numbering sixty experts and approximately the same number of assistants, it is felt that a more specialized organization is better prepared for the demands made upon it.

A report on last year's work under the former organization shows that examination during that period was made in the chemical laboratory of a number of drugs and other pharmaceutical products, food stuffs and beverages, water, cement and pozzuolana, oils and fatty matter, minerals, and agricultural products. In the other department then existing, the research laboratory, studies, as contrasted with examinations, were made of the composition of Chinese medicinal plants; the soya bean and other staple products in Manchuria; the manufacture of alcohol from kaoliang or sorghum; the production of gasoline by dry distillation of oil shale and also by distillation of lime soap of soya bean oil; the improvement of tussah silk; the manufacture of metallic magnesium and its salts from Manchurian magnesite; Glauber salts and other chemicals secured as bye-products of the Manchurian salt fields; glue from animal bone;

dolomitic and slag cement from dolomite and slag; starch from kaoliang and maize; pulp from kaoliang stalk; and various synthetic medicines and dyestuffs resulting as bye-products of coal distillation in the process of extracting oil with benzine or the hydrogenation of soya beans.

Publications were issued in Japanese, most of which are available at the present in that language, on sorghum alcohol, kaoliang pulp, the manufacture of potassium salts from kaoliang stalk ash, maize and kaoliang starch, beans and bean products, the medicinal herbs of Manchuria, salvarsan, permutite or water purifiers, magnesite and lignoid, pottery ware, fire brick, glass, and wild cocoons.

The superintendency of the five departments which have now succeeded to the former organization is distributed as follows: the department of agricultural chemistry, President S. Sera; mineral or inorganic chemistry, Dr. K. Nishida; leather and tanning, Mr. S. Ozawa; organic chemistry, Dr. M. Tanaka; oil and fats, Dr. M. Sato.

Most of the experts are graduates of Japanese universities and technical colleges, while some have received scientific training in America or Europe. Doctor Sera was graduated from the Imperial University in Tokyo in 1914 and spent several years in Germany, France and the United States. In New York he was associated with Doctor Takamine, a chemist of international reputation who made important contribution to the isolation of adrenalin.

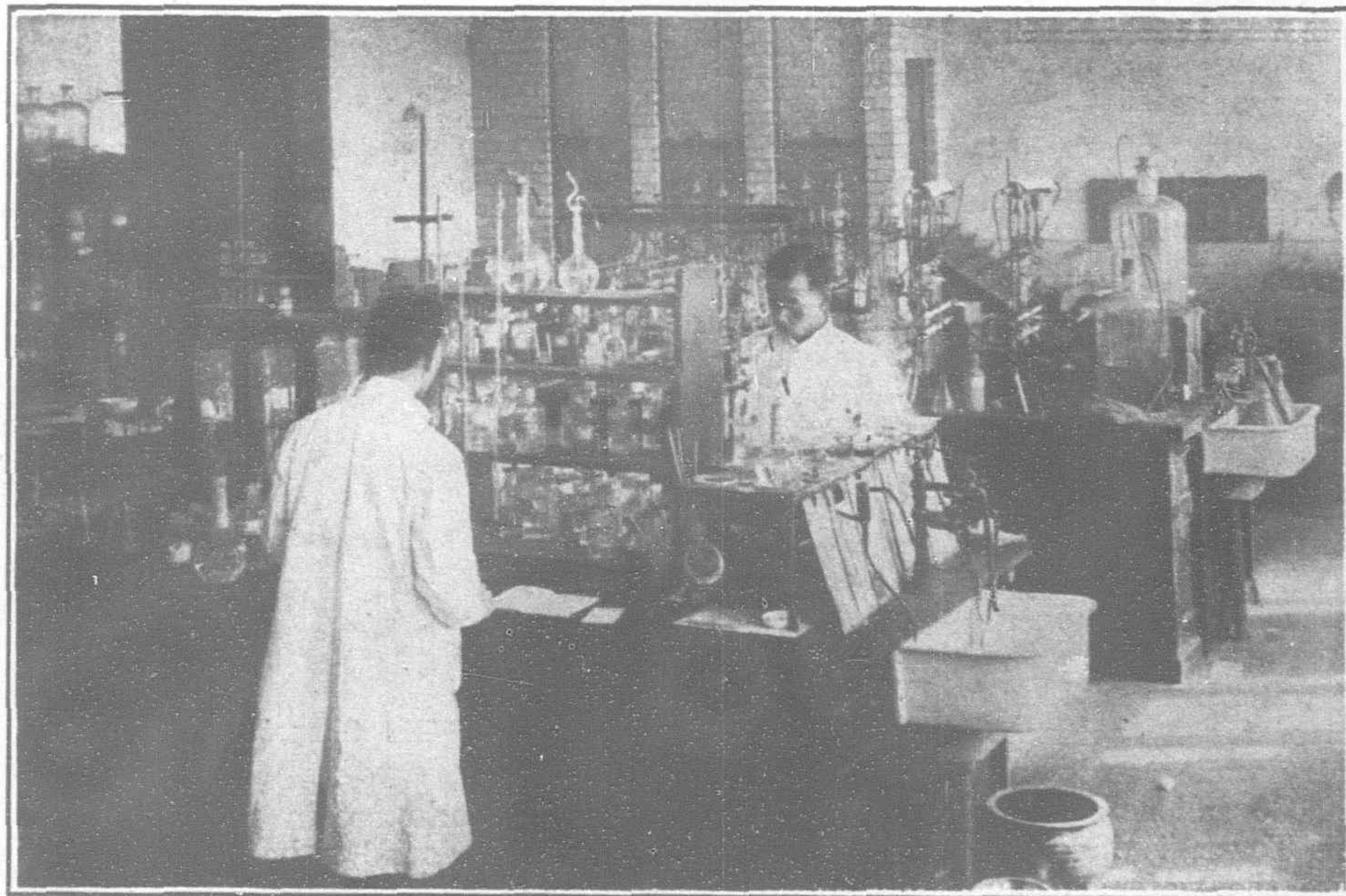
For work at the present the department of agricultural chemistry has joined with that of oil and fats in concentrating on improving present products of or producing new products from soya beans, an article in Manchurian commerce considered of first importance not only

to the railway but to the port of Dairen and to considerable commercial and manufacturing interests in Japan. One of the problems on which the laboratory is at present working is that of learning how to extract oil from beans so as to obtain the best kind of cake for human and animal food.

For extraction most of the so-called modern plants in the Far East are using benzine. The laboratory has employed alcohol, methyl-alcohol, petroleum benzine and other solvents. It is now of the opinion that best results are to be obtained from a benzine and alcohol mixture.



Dr. S. Sera, President and Director of the Central Laboratory of the South Manchuria Railway at Dairen



A View of One of the Many Departments of the South Manchuria Railway's Central Laboratory at Dairen

Although bean cake was formerly used almost entirely as a fertilizer, a condition which still prevails to a large extent, it seems probable that Manchuria will in the soya bean produce an article of importance in assisting to solve the Asiatic food problem, and possibly also that of the West. The latter already purchases a large amount of bean oil for food as well as for industrial uses. One of the products of the laboratory is a bean flour from which oil has been extracted which is white and fine in texture. The uncooked laboratory product has an odor which would seem objectionable, but Doctor Sera says that when this is mixed with wheat flour in proportions up to thirty per cent. highly edible bread and some pastries can be obtained successfully, and that the bean flour adds a needed protein value to similar products made only of wheat. The odor, which at present is comparatively mild and not more evident than in some other household foods, the laboratory expects to eliminate entirely. Doctor Sera says that although he recognizes that it is not alone necessary to find a new food but to get people to employ it, he believes this bean flour may in time come to have a fairly general use.

Another item of value to the Japanese and Chinese domestic markets is the production in the laboratory of soy sauce, an article of general employment in these countries, from bean cake. This is already being produced economically and in merchandisable quantities. A saving is effected both in the ease of using this cake and in the value of the oil extracted before the residue is made into sauce.

The most important work of the department of inorganic chemistry, according to Doctor Sera, is the preparation of magnesium from magnesite, of which there are considerable deposits in various parts of Manchuria. It is especially widely distributed, according to the investigations which have so far been made, in South Manchuria. A very recent product of the laboratory is an artificial marble, made also from magnesite. With a view to possible commercial production of this latter a patent has been taken out in Japan to protect this process.

The department of organic chemistry has in hand at the present experimental work having to do with utilization of coal and its bye-products, especially gas and tar. Part of this program is the

liquidation of coal into gasoline. This work is being done not at the Fushun Collieries but at Dairen. Investigation is also being made of processes for the so-called cracking of tar to produce gasoline. A section of this department is employed at the Anshan Iron Works in testing iron and steel and in making analyses of ore.

The department interested in leather and tanning is making experiments to discover the advisability of attempting to introduce into Manchuria in a practicable way European and American curing and tanning methods. If it were thought that an economic gain would result, the laboratory would be prepared to establish demonstration stations in various hide and skin centers in districts served by the railway to teach producers how to cure, and make it useful for the farmers to use these new methods by establishing a favored purchasing system. If this is not thought advisable, it is possible that the company will construct a *depôt* and tannery at some central location, possibly Dairen, and do the curing itself. The experiments of this recently started department have as yet not brought sufficiently definite results to permit recommendations.

Mr. J. Furusawa, managing director of the Nisshin Oil Mills for the extraction of oil from soya beans, is one of the leading non-official members of the Japanese community in Dairen and the Kwantung Leased Territory. He pays a tribute to the work of the Central Laboratory of the South Manchuria Railway, which is carrying on experimental work in the employment of new methods for the extraction of oil.

At the present the mills in the Kwantung Leased Territory, of which there are eighty-nine, and approximately four hundred in Manchuria, employ either native pressing methods or, in the case of modern plants, a process of extraction by benzine similar to that used by plants in Japan.

In the Oil and Fats department of the Central Laboratory experiments have recently been made in the employment not only of benzine but of alcohol, methyl-alcohol, petroleum benzine and other solvents. The most successful is considered to be a mixture of alcohol and benzine. It has not yet, however, been demonstrated that the saving would be sufficient to warrant a change in extraction method by mills already using the benzine process alone.

Correspondence

Chapei Waterworks

To the Editor,

THE FAR EASTERN REVIEW.

Dear Sir,

With reference to your description of the New Plant of the Chapei Waterworks near Woosung we shall be obliged if you will please correct a few inaccuracies contained therein.

The present capacity of the Waterworks is 10 Million Gallons in 24 hours with provision for an unlimited capacity in the future.

The Water Tower built in the shape of a pagoda contains two Reservoirs. The upper one of a capacity of 50,000 gallons serves as a reservoir for the necessary water for drinking purposes and the hydrants of the New Plant and the surrounding country while the lower tank of a capacity of 120,000 gallons contains the wash water for the Rapid Filters. This Tower is independent of the main feed pipe to Chapei because the water is pumped from Woosung directly into the Water Tower in Chapei, eight miles distant. The accompanying Photo shows the Water Tower completed.



The Chapei Waterworks.

The Works are in operation since the beginning of June and the water is found to be of very good quality.

Yours very truly,

C. LUTHY.

Construction Enterprises in South-west China*

By O. J. Todd

IN the following pages an attempt will be made to present a picture of the situation in south and south-west China as it appears to-day to an engineer who is interested in the economic development of the country on modern Western lines. In detailing my own experiences I shall lay chief stress on the building of highways for motor transport.

Leaving Peking in early October, I took the sea route to Hongkong and Haiphong, then by rail to Hanoi and north to Yunnanfu, completing the section of my journey in three weeks, one week of which was taken up in Hongkong, Canton, Macao and Kowloon, where rapid surveys were made of the transportation facilities in those districts. These last named cities on the coast are known to engineers for their many modern improvements, built in accordance with Western engineering standards.

In Canton one also sees progress along these lines, for here the modern road has invaded the stronghold of an old Chinese city of narrow and crooked streets. It is only in very recent years that broad, well-paved streets with good alignment have been known in this great city. Knowing the conservatism of old Canton, one marvels at the strides that have been made in rebuilding the city on modern lines. With the Chief Engineer of the Canton-Hankow Railway, we motored over miles of these new macadam roads and out beyond the business district to the residential parts, where a new motor road leads to the site of Canton's future port—Whampoa. This suburban road had just been completed under the direction of our escort, Mr. Yee, who had previously served an apprenticeship with the Michigan State Highways Commission after graduation from the State University.

The railroads, too, were being rapidly put in order after some disruption incident to the civil war. I was later informed that by January all three railways out of Canton were running full train schedules on time, with satisfactory service to the general public. The railway from Kowloon to Canton is a fine piece of modern engineering, and the service as I found it in late January was first class. The trains were making the trip on schedule time—less than four and a half hours for the run.

Comfortable steamboats were found running from Hongkong to Canton, Macao,

and Wuchow (up the West River). So this coast district around Canton and Hongkong reflected most unmistakably the effects of Western engineering practice in transportation, to say nothing of other lines including modern water supply, city lighting, etc.

There is little difficulty in getting to Yunnan after changing boats at Shanghai and Hongkong for Haiphong, where the French narrow gauge railway was taken to Hanoi and then north to Yunnanfu. The last named city was reached on October 27.

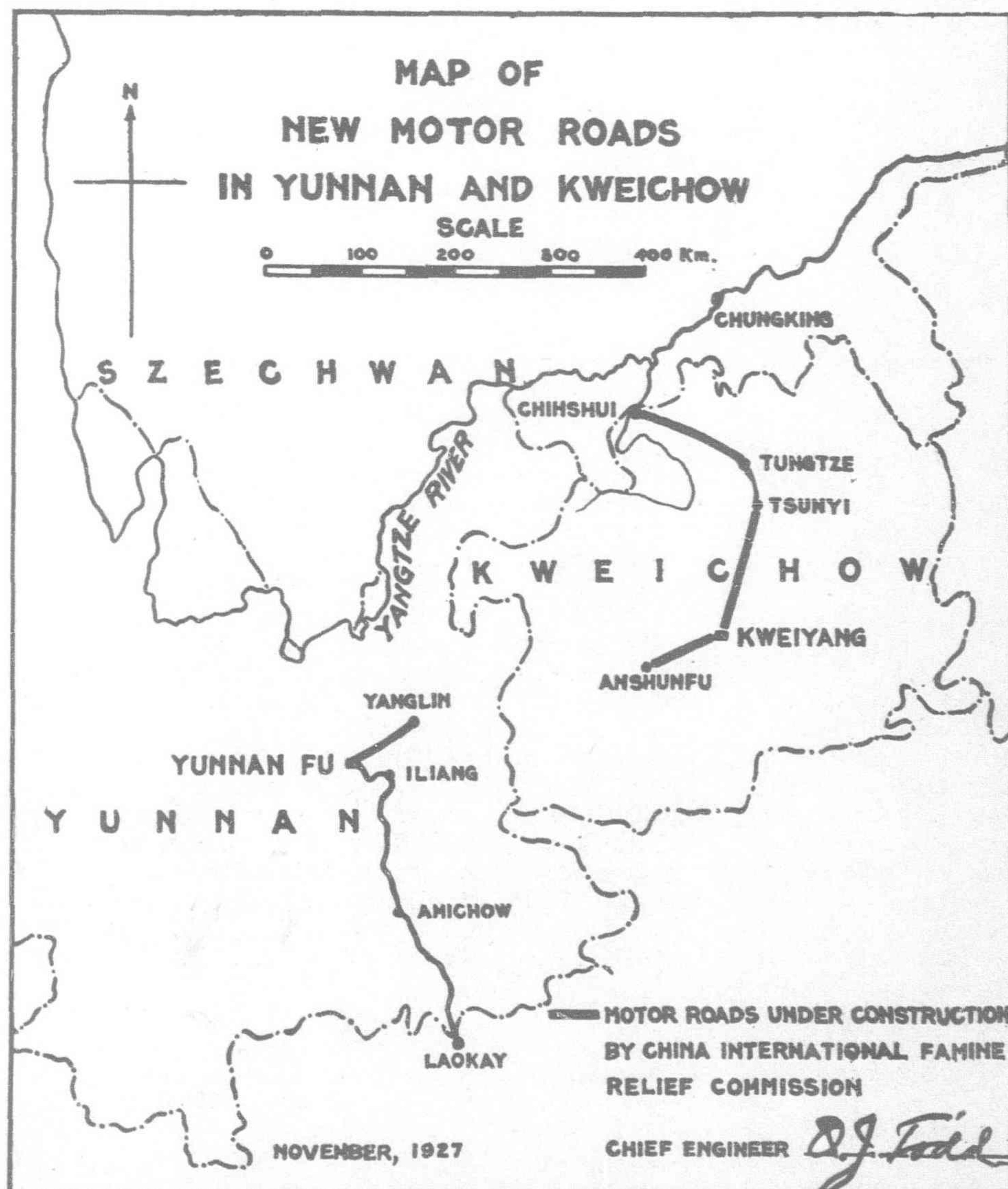
I was confronted in Yunnanfu with a situation quite in contrast to the Canton area. Here we were at the "jumping-off place." The narrow gauge railway from Indo-China through southern Yunnan had made ingress to the capital easy and fairly comfortable. This railway taps the great Yunnanfu plain, or plateau, lying over 6,000 feet above sea level—a rich agricultural center to which much of the wealth of the province gravitates. But Yunnan province is a vast territory with high mountains from border to border and almost without roads, except those over which men on foot and mules may travel. Cart roads are local, short, and poorly maintained. It is an undeveloped country from the engineer's viewpoint.

The next two weeks we studied road building in Yunnan going over the 30 li of new motor road already built west of the capital and traversing the old cart road east and north. The first week of

November was given over to a study of this route, which is proposed for the new motor road from Yunnanfu to Yanglin, and then north to Yangkai, altogether 160 li. It is a red clay country, with rock intrusions here and there. It may all be called part of the Yunnanfu plateau, though five li out of the city east of the railway station we leave the great rice plain and enter rolling country of little value till the valley of Yanglin is reached.

The country through here has no serious grades and no difficulties to construction appear except that rock and gravel for surfacing are not convenient. After rains the roads are slippery and the sticky clay makes travel hard. But the wind and sunshine quickly dry the soil.

We decided to spend \$250,000.00 for building a well-crowned motor road without macadam surface over this route. It is to be



* Chinese Economic Journal, June 1927.

24 feet wide and raised well above any rice fields in its path. It is to be used only in dry weather and then by automobiles and wide-tyred carts. None of the crude native carts is to be permitted on it. This road will be built on moderate grades not exceeding 7 per cent. The macadam surface will be put on a year or more hence by the provincial authorities.

The present construction work is being carried out by local farm labor under direction of a returned student with several years' experience on American highways. Actual construction started in mid-December.

Due to the use of very crude country carts in this region these vehicles will either be routed over other roads or restricted to an eight-foot path on one side of the new road. The solid wooden wheels of these vehicles soon become irregular by bouncing over the rough stone pavements and with their rough edges tear up the earth roads in damp weather. There is a fine opportunity here to introduce a new type of wide tyred wheels preferably made of steel. They could be used with little damage to the new motor roads.

The topography of the country north-east of Yunnanfu toward Yanglin and beyond to the north is favorable for road construction. There is no difficulty here in getting good grades with a fairly straight alignment. The soil is mostly red or yellow clay with but little sand. In wet weather it is nearly as sticky as the clay of Hunan or Kweichow, but with sun and wind dries rapidly. Fortunately for road maintenance, there is a great deal more sunshine in this Yunnanfu region than in the provinces of Kweichow or Szechuan. Also there is little brush and few shade trees to hold dampness. This makes an earth road more possible than in Hunan, Kweichow or Szechuan.

The matter of paving this Yunnan road is one to be considered later. Eventually a macadam surface at least twenty feet wide and a foot thick in the middle should be placed on all of this road bed. As an earth road it will probably not be usable for more than 60 per cent of the year. But stone is not readily at hand near Yunnanfu as in the more mountainous districts along the eastern or northern border of the province. Its cost will be rather high compared with the earthwork, but the province, or the city of Yunnanfu, can and will eventually raise the funds to pay for such surfacing.

The benefits to be derived from these motor roads are incalculable at the present time, for the resources of Yunnan have never been properly developed. From a famine prevention standpoint there is every reason for improving travel facilities for approach to the capital. The bringing in of hides, wood oil, silk, etc., on ponies from remote points days distant, is an extravagance that keeps the country in its state of obscurity. Rice or wheat seldom are carried far, due to the great cost of transport, whether on the backs of men or animals. It averages from 35 cents to 50 cents per ton-mile over the mountain paths where no carts can go. The radius of productive grain transport is therefore small indeed. In time of drought, famine cannot be avoided except in very sparsely populated districts. Good communication, then, will prove the first great help in solving the food problem in this province. It was after coming to this conclusion that the Famine Commission decided to put all its available funds into the building of standard roads for motor traffic.

The last week of November and the entire month of December were spent in the province of Kweichow, walking over stone paved paths where carts have never been known. We entered the province between Lo P'ing and Hwangtsopa in the south-western corner of Kweichow after crossing a fine stone bridge over a turbulent mountain stream that goes to feed the main north branch of the West River. In bridge building these natives are skilful. The center arch of this bridge is 70 feet across, the two other arches being each 35 feet. The structure is substantial and artistic. Other bridges made from the local limestone rock show a skill in this line of work equal to anything of the kind found elsewhere in China. Several of these were crossed on the long road leading north-east to Kweiyang, the capital. Nearly all of this long road is stone-paved and from three to ten feet in width depending on its location with respect to large towns. Due to the frequency of rains, travel is extremely difficult over the clay for a great portion of the year. Men, who carry most of the loads here, must have good footing in order to make any progress in handling freight or carrying mountain chairs.

In making the journey into Kweichow, we took the main road toward Kweiyang to Chu Ching Fu, where two days were spent in studying a flood problem on the Nan Pung Kiang, a branch of the West River. North-east of the city a few *li* farm lands were

under water and could be drained. We were informed that several thousand *mow* of good farm lands had been ruined in the past ten years, due to accumulation of mud raising the river bed. An investigation showed that it was not the rock reef many miles down-river but the earth diversion dams near Chu Ching Fu that caused the rapid silting-up.

Now a good sized job of river cleaning or dredging confronts the authorities. The special River Bureau created by the Yunnan Government to study the problems of this river has been making a survey at my suggestion. When the funds can be raised a programme of river cleaning will be undertaken. This may involve an immediate expenditure of half a million dollars.

Kweichow needs motor roads as does no other province in the country. It is very mountainous country with no navigable streams worth mentioning. Only at the northern border are there feeders to the Yangtze that can be used by medium sized craft. Good roads are the only means of developing the country and making it accessible to the outside world. Railways are needed but will not come for a few years. Motor roads are possible now. Trunk lines should be built from Kweiyang to the north, the east and the south-east, and later to the west to Yunnanfu. The most important of these main roads seems to be the one to the north. It is on this work that the Governor of Kweichow, Tsao Chi-tsun, has concentrated his efforts and enlisted the support of the Famine Relief Commission.

Reaching Kweiyang the last day of November, I was surprised to find the activity that existed there in road building. Over a thousand soldiers as well as famine refugees were at work on a good thirty foot motor road around the city. This loop will be about thirty *li* in length. Early in December the Governor had organized students of both sexes for this work and they were going at the new task in good humor. It was planned to have the boys work one week and the girls the next, having class work in the schools in alternate weeks. This plan includes all able bodied students over 14 years of age, taking men from the law school and girls from the normal school. Even though the days they worked were short compared with those worked by hardened coolies, a right beginning had been made.

A two-weeks' inspection trip was made north from Kweiyang to Tungtze near the Szechuan border. From this city the main road will run west and a little north to meet a branch of the Yangtze at Chihshui, whence motor launches can carry goods and passengers to Chungking. Altogether this road will be about 400 miles (1,200 *li*) in length. Its cost is estimated at approximately \$2,500,000. The grades are to be 7 per cent. maximum except for very short stretches where 8 per cent. may be used. Limestone is plentiful everywhere so that the middle 20 feet will be macadamized. It is planned to make the grade 30 feet wide over all, allowing five feet on the hillside for drainage. There will be one rather bad river crossing at the Wu Chang Ho, but here the engineering problems are not extremely difficult.

With the local labor reasonable in price, and in view of the plan of the Governor to use soldiers for the greater part of this work, it seems likely that this road can be built for about \$6,000 per mile (\$2,000 per *li*). The one large bridge will cost upward of \$100,000. For the first year or two a ferry system will be employed at that point. Smaller bridges will be of local stone built at a low cost. Everywhere the counties or *hsiens* will be assisted by a local labor road tax or assessment. Each village will be given a certain stretch of road to build on the same plan used in Kwangsi to the south.

The Famine Commission is proceeding with this work, using first all the poorer people that care to come to the project. Then farmers will be employed to recruit up to about 2,000 men. Mr. W. T. Wong, an American trained engineer, has already been sent in with an engineering party to locate and supervise construction of this trunk line under direction of the Famine Commission working with the Governor. It is a two year undertaking with things running as planned. Political upheaval in the province would delay the work. At present, however, peaceful conditions prevail there, and the province is particularly free from bandits. There also appears to be a united spirit on the part of all classes to support the Governor in his endeavor to open up the province. Those who went through the typhus epidemic of less than two years ago near Tsunyi, and those who are interested in a fairly rapid mail service, as well as merchants, missionaries and officials, are all working toward the same end.

(Continued on page 419)



Chinese Water Pump

Population, Food Supply, and American Agriculture

By O. E. Baker,

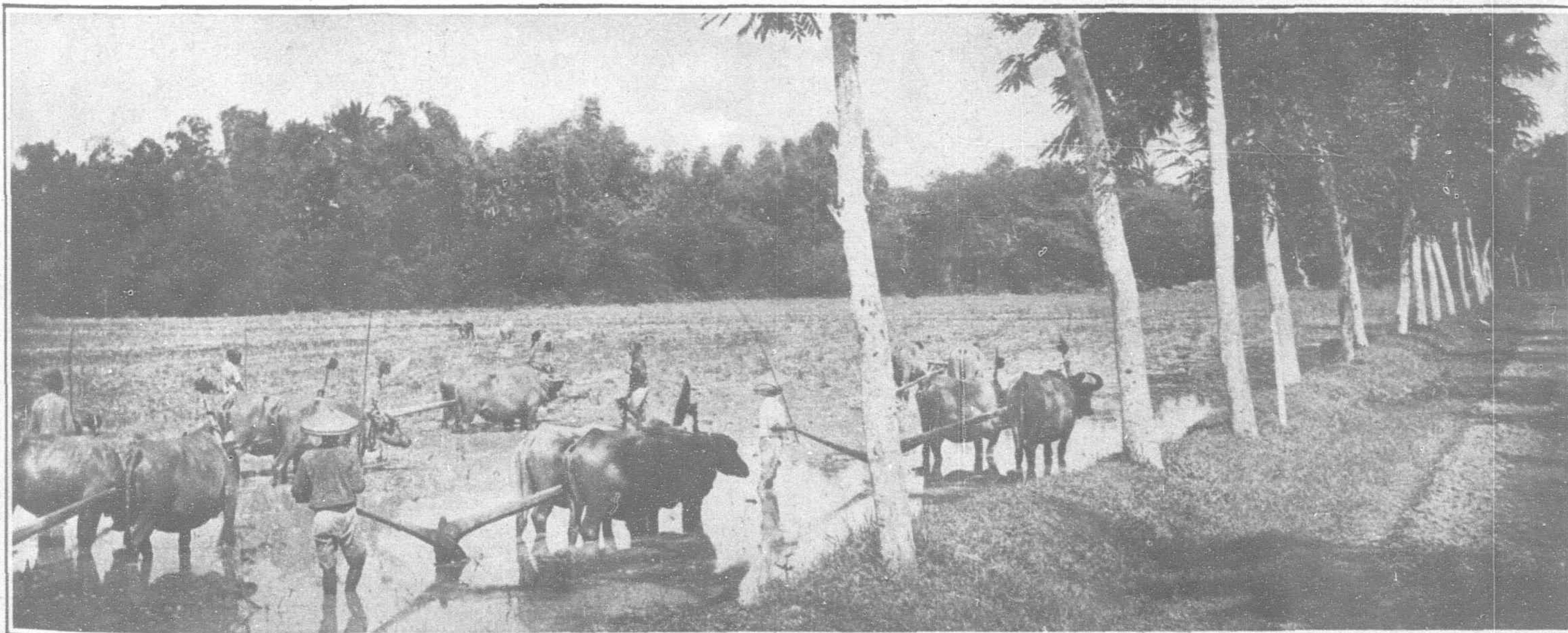
*Agricultural Economist, Division of Land Economics

THE three principal centers of the world's population are south-eastern Asia, Europe, and North America. The extent of the arable area, including both land in crops and that which it is physically possible to use for crops, in these three regions is similar in magnitude—in each a billion and a half acres, more or less. But southeastern Asia and adjacent lands (India, Siam and Indo-China, the East Indies, China and Japan) contain about 900 million people, or nearly half the population of the world; whereas Europe has a population of only about 500 million, which is between a fourth and a third of the world total; and North America has less than 150

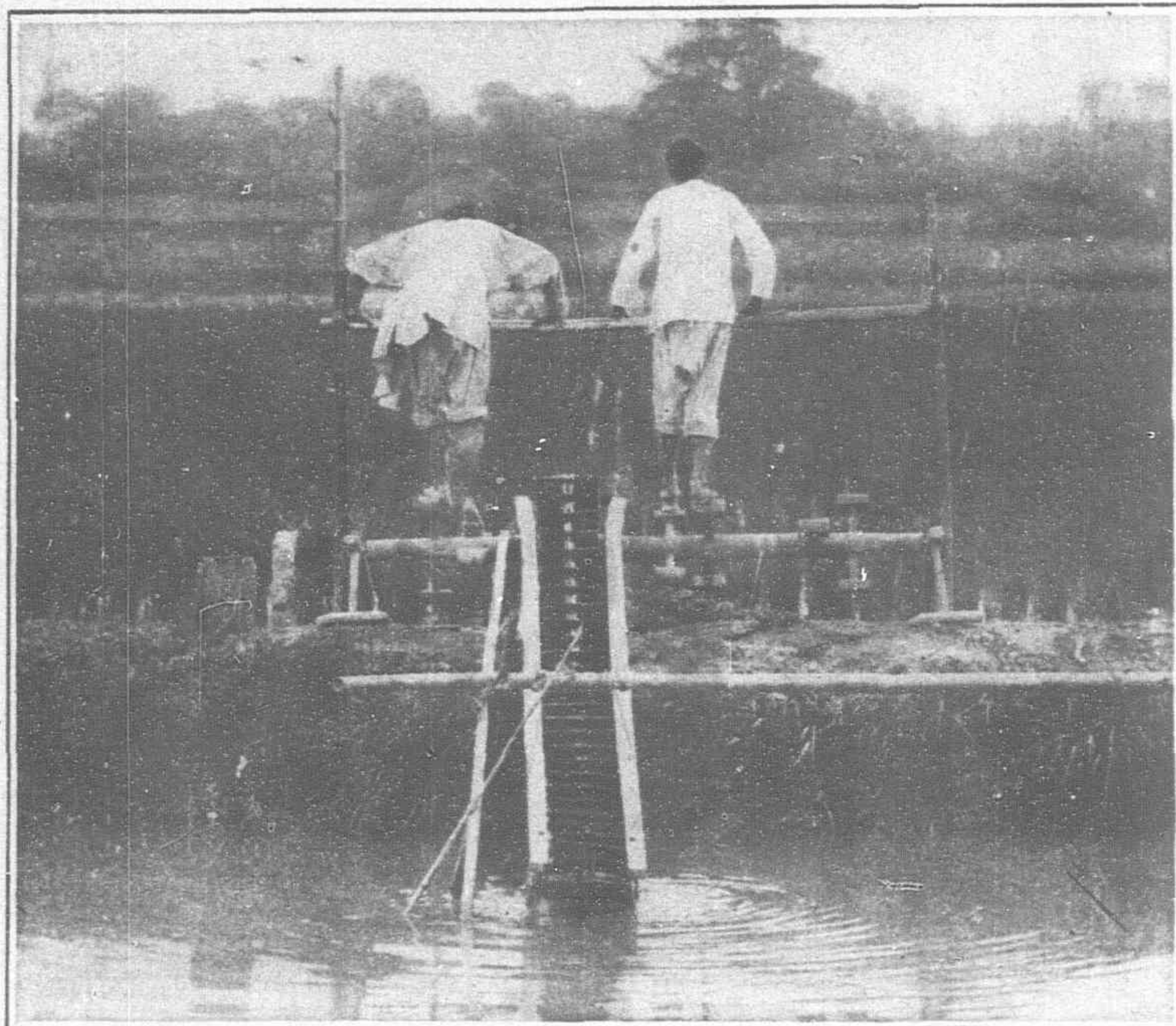
million people, or only a twelfth of the population of the world. As a consequence, there is fully three times as much potentially arable land per person in North America as in Europe, and about six times as much per person as in southeastern Asia.

But the population of North America is increasing at a more rapid rate than the population of Europe or southeastern Asia. If Mexico and Central America be excluded, for which reliable data

*Address before the joint session of the Farm Economic Association and the Rural Section of the American Sociological Society, in Washington, December 29, 1927.



Ploughing Ricefields in Java



Chinese Foot Water Pump

are not available, the population of North America is increasing at the rate of about 1.5 per cent. a year, of which about 1.1 per cent. is by natural increase and 0.4 per cent. is by immigration. The population of Europe, excluding the U.S.S.R. (Russia), for which data during sufficient duration are unavailable, is increasing only about half as fast, or, perhaps, 0.75 per cent. a year; while the population of southeastern Asia as a whole probably is not increasing at present, in fact, owing to the troublesome times in China it may be decreasing.

It is natural, therefore, that many people in Europe and a few in North America should see in southeastern Asia a vision of the future condition in their own continent and be troubled in mind, if not oppressed by the thought of approaching population pressure, poverty and weakness. Let us, therefore, consider the validity of this assumption that conditions in southeastern Asia with reference to population and agricultural production are prophetic of future conditions in North America. Although, as will appear later, we have grounds for optimism, we should also realize that our anticipations are based on a continuation of present trends, whereas nothing in the modern world is certain except change, consequently it is possible our calculations may prove to be mistaken.

Like all economic problems, this food problem has two sides, a demand side represented by population, and a supply side represented by agriculture. Let us consider the progress of population and then the progress of agriculture in each of the three continents, after first noting the progress of population in the world as a whole.

The Progress of Population in the World

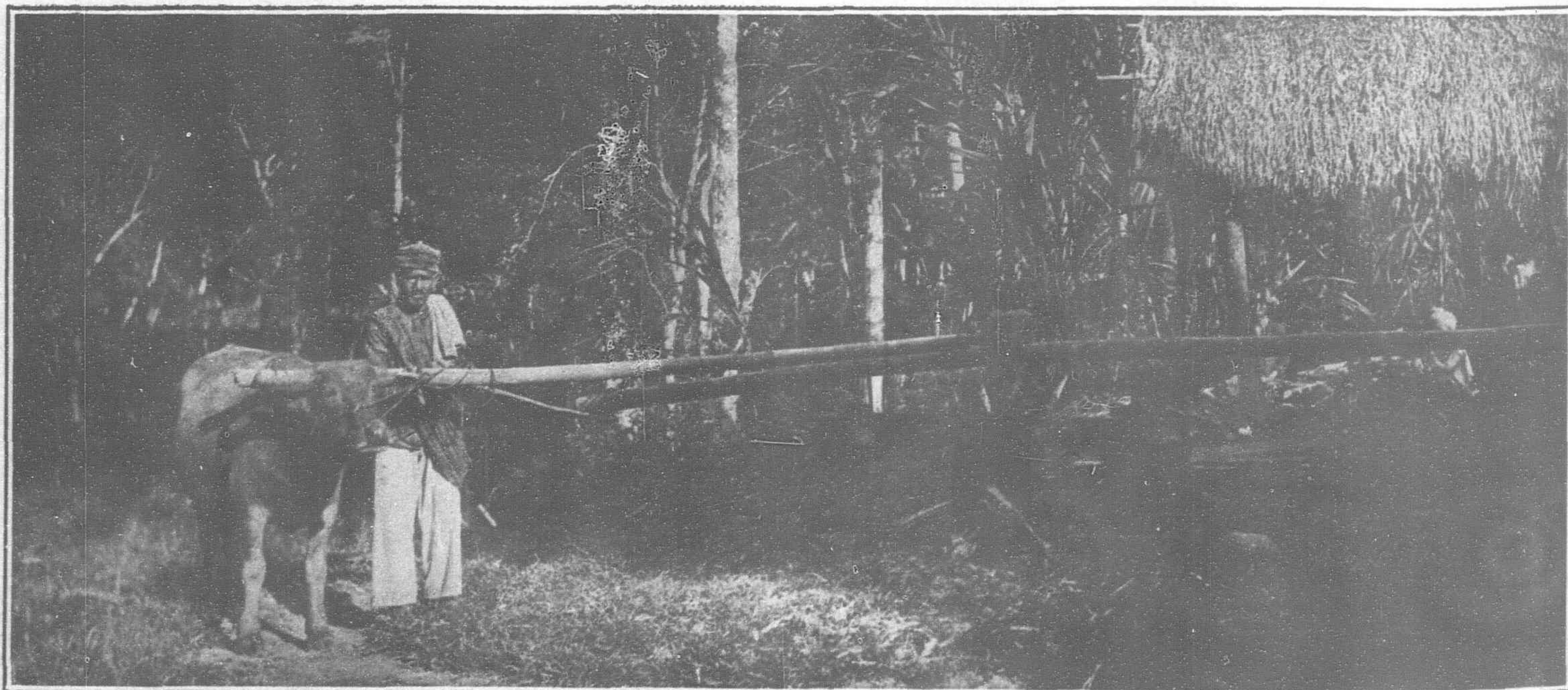
The population of the world was about 500,000,000 in the year 1700, according to several estimates, 600,000,000 to 700,000,000 in the year 1800, about 1,000,000,000 in the year 1850, probably 1,500,000,000 by the year 1900, and is about 1,900,000,000 to-day. The population of the world has almost trebled since the year 1800, and prior to the World War was increasing at the rate of about 20 millions a year, which is an addition equivalent to the population of the United States every six years.

It appears, however, that a slackening in the rate of increase in the world's population is occurring. (Fig. 1). This is owing primarily to the attainment of a stationary population in China a half century ago, if the estimates may be accepted, and to a trend toward such a condition during the past two decades in India, which, however, may prove transient. Moreover, as population has increased in Europe and North America during the past quarter century or more, the rate of increase has lessened somewhat proportionately, so that the actual increase in numbers is now more or less stationary,—about four millions a year in Europe and nearly two millions in North America.

The Progress of Population in the Orient

The rapid expansion in the world's population during the last two or three centuries attained momentum first, it appears, in southeastern Asia. According to the successive returns of the Chinese census given in a recent article by Chang-heng Chen in the "Chinese Economic Journal" * the population of China in 1750 was about 180,000,000, but by the year 1800 it had risen to 300,000,000 and by 1850 the advance was practically over and the population had reached a stationary stage at about 425,000,000 (Fig. 2). In 1923 the Post Office estimate, based on returns from district magistrates, was 428,000,000 for the 18 provinces of China proper, and about 440,000,000 for the entire Republic. A recent study by Professor Willcox, of Cornell, based on Ambassador Rockhill's data, and the discovery of a copy of the 1910 census, supports this evidence of a rapid increase in the population of China during the eighteenth and first half of the nineteenth centuries, but indicates that the Chinese Post Office estimate of population at present is too

* "Changes in the Growth of China's Population in the Last 182 Years" by Chang-heng Chen, "Chinese Economic Journal," January 1927, pages 59-69.



Primitive Sugar Mill in the Padang Highlands; Sumatra's West Coast

high by more than 100,000,000.* If the Rockhill-Willcox estimate of about 300,000,000 people at present in China be accepted, or 315 with Manchuria and Sinkiang, and it was doubtless no greater 75 years ago, it would appear that the increase of population in China between 1750 and 1850 was of a similar magnitude to that in the United States between 1820 and 1920. Whichever estimate of China's present population be accepted, it is interesting to note that the population of China in the year 1750, according to the official returns, was only about 25 millions greater than that which the United States will reach about the year 1950, and was increasing at about the same rate as the increase in the United States to-day.

In India it is not possible to trace the progress of population so far back, but between the first Census in 1871 and the fifth in 1911 British India (excluding the Native States) gained 60 million people, which is considerably more than the increase in the United States during these forty years. The 1921 Census, however, shows very little increase since 1911, either in British India or the Native States. This is doubtless owing in large part to the epidemic of influenza in 1918, but it also appears probable that the population of India is approaching the saturation point under the present conditions of agricultural technique. However, the rapid expansion of manufacturing in India, as well as in other oriental countries, would extend the period of population increase for many years, provided food could be obtained to support the increase.

The recent increase in India's population can no doubt be credited in large part to British peace, protection of property and life, and improved sanitation. Java, for instance, under the rule of the Dutch, has increased during the past century from four millions to 35 millions in population. Probably a similar period of peace and protection, with, doubtless, a little advance in scientific knowledge, accounts for the rapid increase in China's population during the Eighteenth Century and first half of the Nineteenth.

Agricultural Progress in the Orient

But in both India and China the increase in population has occurred without any marked advance in agricultural technique. The yield per acre of all the cereals is considerably lower in India than in the United States, and this is almost certainly true in China also, except for rice. There has been little development of dairying in either country, despite the fact that cattle have been raised for centuries, and, in general, the breeds of livestock are not as productive as in the United States. It appears probable that in both India and China the increase in population was accompanied by a lowering of the standard of living, although there is some evidence,

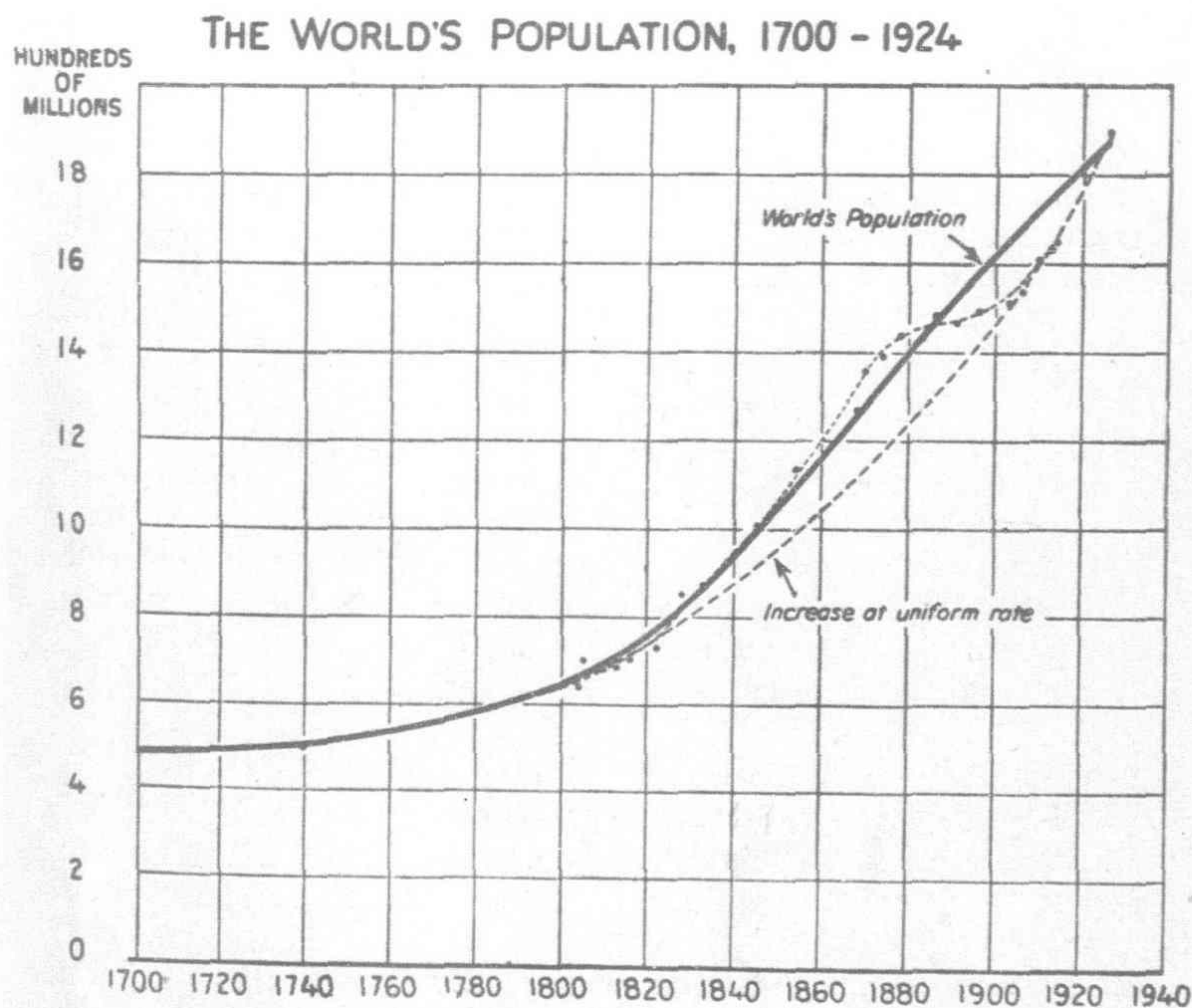


FIG. 1.—Increase in the world's population since 1700, has been nearly three times as great as the total increase during the many previous centuries but rate of increase has been decreasing since about 1900. The graph is from G. H. Knibbs, "The Mathematical Theory of Population," in Report on Australian Census of 1911, Vol. 1, Appendix A, Bureau of Census and Statistics, 1916.

TREND OF POPULATION. CHINA AND UNITED STATES 1750-1927

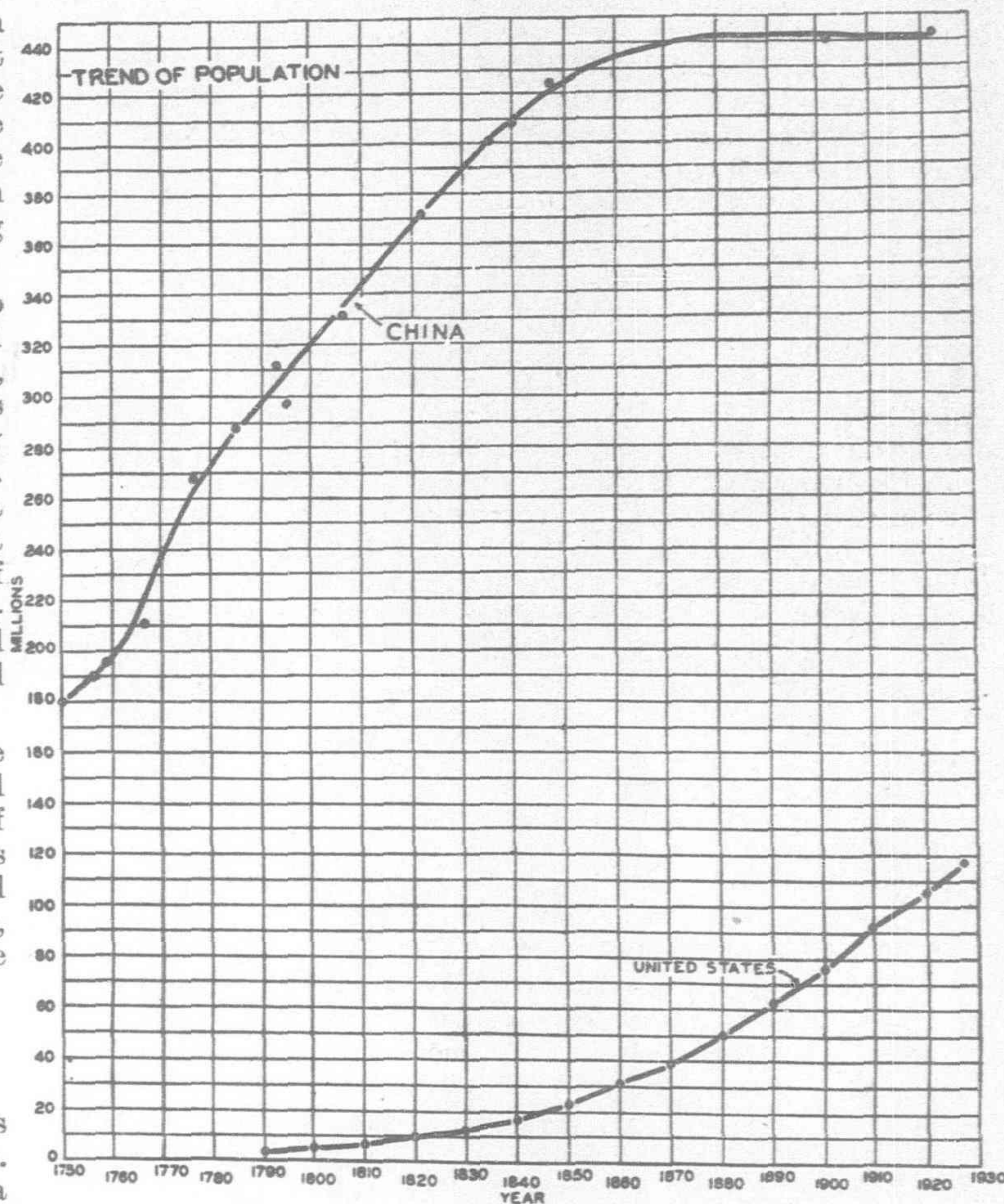


FIG. 2.—Between 1750 and 1850 the population of China increased about 240,000,000, if the official estimates are accepted, but only 140,000,000, more or less, if the Rockhill-Willcox estimate of China's present population is taken as a base. This smaller estimate seems more probable. The data for China shown in the graph are from an article by Chang-heng Chen, "Chinese Economic Journal," January, 1927, (see footnote No. 1.).

notably the recent increasing per capita consumption of wheat, that the standard of living is rising in India at present.

Another surprising fact about China's agriculture, (it is not true of India's agriculture), is that the proportion of the potentially arable land which is actually in crops is much smaller than in the United States. Of the 700 million acres, more or less, which it is physically possible to use for crops in China, only 180 to 200 million acres were cultivated in 1918, according to official data, † or 25 to 30 per cent; whereas in the United States of the 975 million acres, more or less, which it is possible to use for crops, about 370 million acres, or nearly 40 per cent, were so used in 1919.

Probably two-thirds of the farmers of China are dependent on their own muscles for power, and apparently they can spade up or hoe up only two to four acres of land within the time permitted by the progress of the seasons. Experiments by men in the U. S. Department of Agriculture indicate that it takes 10 to 15 days to spade an acre. Two to four acres of grain (the cereals constitute about three-fourths of the total crop acreage in China) does not yield sufficient food to support a family unless it is grown on productive land. There is a vast area of semi-arid land in China, similar to the land in the western portions of our winter and spring wheat regions, but it cannot be utilized for lack of power. Whereas in western Kansas the crop area per farm averages 200 acres, yielding 1,200 to 1,400 bushels of wheat or equivalent, in northwestern China the

* "The Population of China in 1910," by Walter F. Willcox, March 1928, "Journal of the American Statistical Association," pages 18-30. (The writer was permitted to read the manuscript prior to publication).

† "Statistical Tables of Agriculture and Commerce, 1918," issued in Chinese by Department of Agriculture and Commerce, Peking, 1921. See also "Agriculture and the Future of China" by O. E. Baker in "Foreign Affairs, April 1928."

average is only four acres of crops per farm. Even to spade or hoe up this acreage requires 40 to 60 days. At seven bushels of wheat per acre, only 28 bushels would be raised on the four acres, which, after allowing for seed, is scarcely enough to keep life in two people for a year. So crop production in China is found mostly in the valleys and on river deltas, where much of the land can be irrigated, and where three times as much wheat per acre can be raised as on the less moist or less fertile uplands, or five times per acre as much rice, if the climate permits.

In Japan scientific technique and economic organization have supplemented the beneficent influence of a stable government, and as a consequence not only has population doubled in the past 50 years, but also the real income per capita has approximately doubled, according to a statement made to me by Dr. Nasu, Professor of Rural Economics in the University of Tokio. However, despite the fact that Japanese farmers are even more dependent than Chinese on human muscle for power, fully three-fourths of the potentially arable land is in crops. This is owing partly to the humid climate, which provides sufficient moisture everywhere for high yields, and partly to the fact that Japanese farmers have available most of the assistance that modern science can afford. The agricultural experiment stations and other technical institutions are as highly developed in Japan as anywhere in the world. Partly as a consequence, the utilization of the agricultural resources has proceeded closer to the physical limit than elsewhere in the world probably, except Java, and Japan is facing the problem of population and food supply in all its stark severity.

Since 1922 the loss of crop acreage to encroaching cities and other non-agricultural uses has been greater in Japan than the gain

POPULATION OF THE UNITED STATES AND THE PRINCIPAL COUNTRIES OF EUROPE: 1800-1927

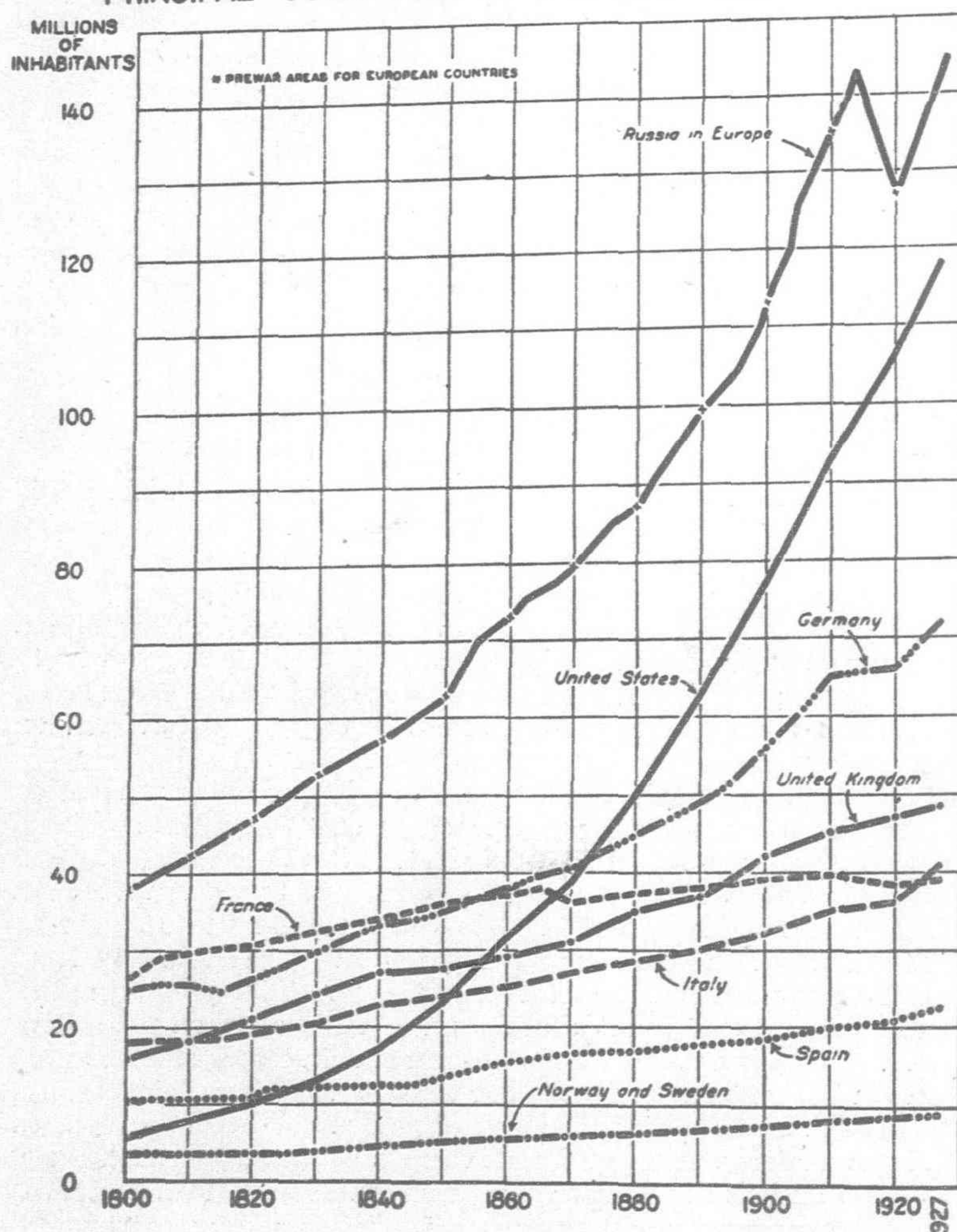


FIG. 3.—Population of Europe nearly doubled during the Nineteenth Century, and during the first quarter of the Twentieth Century it increased about 25 per cent. Even the severe losses by disease, starvation and violence during the World War were able to outweigh the natural increase of population only in Russia and France. Data are from graph in U. S. Census 1910, Vol. 1, page 35, supplemented since 1910 by figures published in the Statesman's Yearbook.

POPULATION OF THE UNITED STATES 1850-1920 AND ESTIMATES OF POPULATION 1930-2000 A.D.

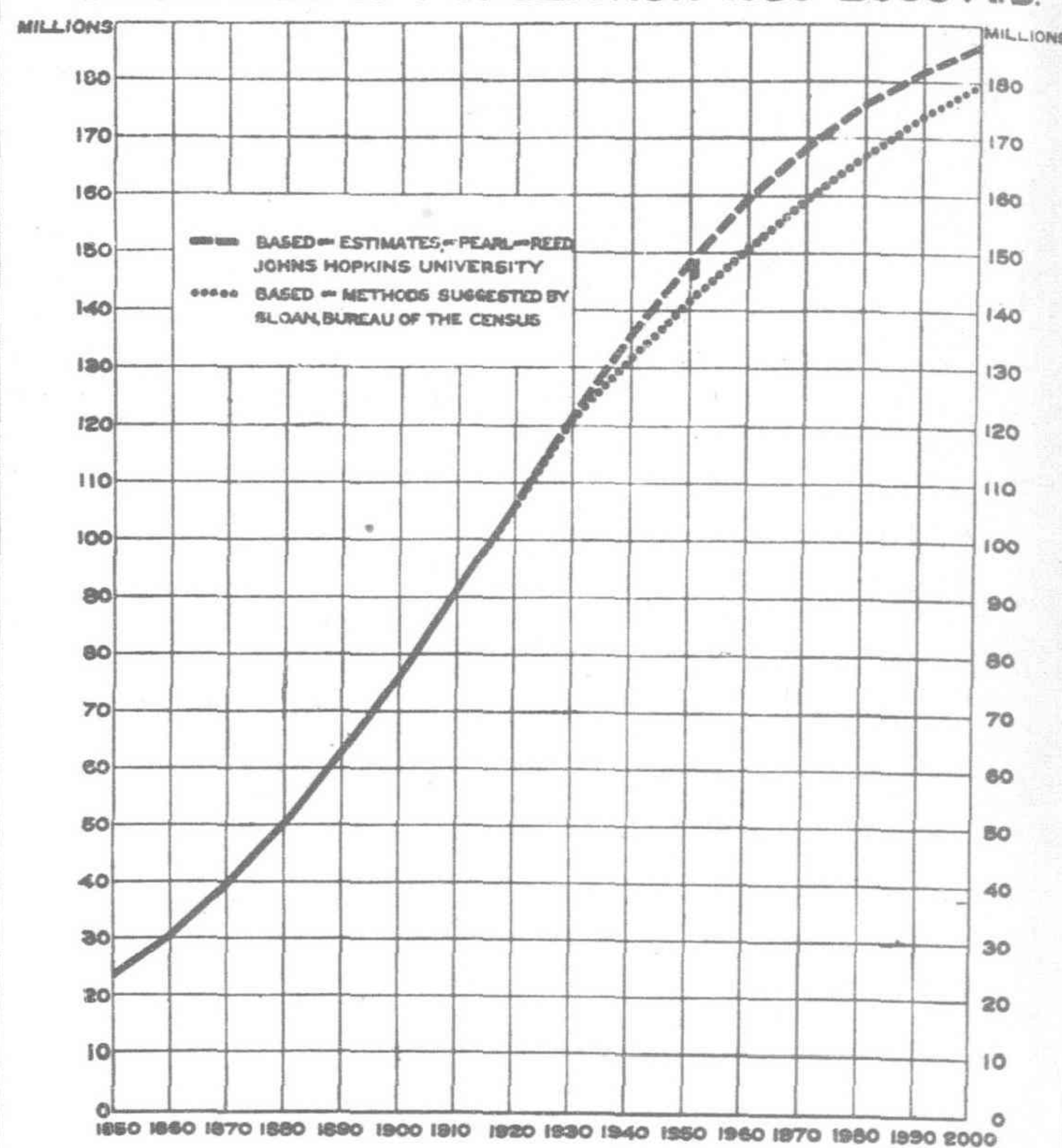


FIG. 4.—Population of the United States is now increasing about its maximum amount yearly. The statistics indicate that this decreasing rate will soon overbalance the effect of the increasing base number, and the actual increase in population begin to lessen, until a stationary population of about 200,000,000 is reached soon after the year 2000. This is only a prediction on the basis of the trend in birth and death rates and present age grouping of the population.

through clearing and irrigation. Moreover, the crop yields per acre have been brought to a high point, comparable with those in northwestern Europe, and can not be raised much higher. The economy resulting from direct consumption of the crop products instead of feeding a portion to livestock has been largely achieved, although a serious loss is still permitted in the milling of the rice. The point has been reached, apparently, where agricultural science can not offer much more help. Whereas there are three acres of crops and nine acres of pasture and range land per person in the United States, a half acre of crops per person and considerable pasturage in China, in Japan there is only one-fourth acre of crops per person and almost no pasture. This fourth of an acre in Japan produces, probably, as much as the half acre in China, but the limit of production per acre is being approached. Unless Japan can find a market for its manufactured products abroad, the prospect is gloomy. The greatest desire of Japanese statesmen to-day is not unrestricted immigration to the United States, but lower tariffs or reciprocity. So long as the Japanese people are unwilling to consider smaller sized families, the only alternative is to develop as a great industrial and commercial nation like Great Britain, a course that is full of difficulties and dangers.

The Population Problem in the Orient

The Orient, therefore, does not seem to afford much help in finding a solution to this population problem. China might imitate Japan, further develop modern science and industry, and probably double its present population without diminishing the average individual's welfare, but this would only postpone for less than a century facing the fact of declining well-being. However, this development of modern science and industry in China is worth while promoting, and during the century a great change in social traditions and ideals might be achieved.

From the standpoint of a permanent solution the depressing feature is that nowhere in the Orient does there seem to be an



Women transplanting the tiny rice shoots. They must often walk sometimes knee deep in the slime and water that covers the rice field, for some two weeks, after the planting, for rice is a water plant and needs constant care.

appreciable tendency toward voluntary restriction of population. Obviously, when there is no voluntary restriction there must be ultimately the involuntary restriction that Malthus described. Although in India the birth rate appears to be falling slightly, in Japan the birth rate was rising until last year, and, apparently, is a third higher now than it was 50 years ago. However, the death rate has also increased, so that the natural increase rate has risen from seven per thousand to only 11 per thousand. For China no statistics are available, but it appears clear that the probably stationary population is owing to a high death rate, especially high among infants and the aged, and to wars, local famines, and occasional outbreaks of some pestilence.

The Progress of Population in Europe

Let us turn, therefore, to Europe, especially to northwestern Europe. In 1750 the population of Europe was, possibly, 170 millions, or less than that of China. By the year 1800 the population had increased to about 200 millions, in 1850 it reached 280 millions, and by 1900 it was nearly 400 millions. During the past quarter century, despite the devastations of the World War, it has increased to 500 millions (Fig. 3):

This increase in population, unlike that in China and India, has been accomplished without a decrease in the standard of living; indeed, it appears probable that the per capita consumption of meat, of milk, of fruit, and of fresh vegetables, which are normally much more expensive than the cereal foods, has increased materially during the past century in most countries of western and central Europe, in some countries as much as 50 per cent.*

How this extraordinary increase in both population and average well being was accomplished may be briefly noted with reference to England, though England of course was in advance of most of the Continent both in agricultural practice and in industrial development. In the year 1600 the population of England and Wales is thought to have been about 5,000,000; in 1700 about 5,500,000; in 1750 about 6,500,000; in 1800 about 8,900,000;

whereas in 1901 it was 32,500,000 and to-day is over 39,000,000.

The Progress of Agriculture in Europe

The increase of agricultural production in Europe, and likewise in America also (for American agriculture has grown out of European agriculture), is owing to many more influences than is commonly realized, and some of these influences have been operative since the Middle Ages. For the benefit of those who are not familiar with the history of agriculture in northwestern Europe, we ask the indulgence of those who are familiar with this history, while we venture a few generalized remarks narrating, very briefly, some of the important steps in the progress of production. Like all generalizations, these statements are neither entirely accurate nor adequate, yet they will afford a helpful background to be kept in view when we note later the recent progress of agricultural production in both Europe and North America.

The increase of agricultural production in England, and in most of northwestern Europe as well, can be traced back, in large measure, to the spirit of individual inquiry, which led both to the Protestant Reformation and to the development of modern science. Even during the Middle Ages England afforded a haven for the heretics from the Continent, many of whom were artisans. These located usually in the towns and villages, where greater freedom to work and worship prevailed. Hebrews also found refuge in England, and worked with the artisans in the development of urban industries. As the towns grew the demand for food and raw materials grew also, and thus commercial agriculture arose. The profits derived from the sale of agricultural products promoted the development of private property in land, and this led to the Inclosure Acts. These Acts permitted the consolidation into a contiguous farm of many small parcels of land that had been operated previously only in

* Undoubtedly the standard of living is lower than before the World War in some of the formerly belligerent countries, and in Great Britain it may be no higher than a quarter century ago. But there can be no doubt that a great advance occurred in practically every country during the century prior to the World War, and since the war the upward trend has been resumed. On consumption of meat in United Kingdom, France, and Germany see McFall, R. J., "The World's Meat," New York, 1927, pages 155, 191 and 256-257.



Women at Work in a Chinese Rice Field

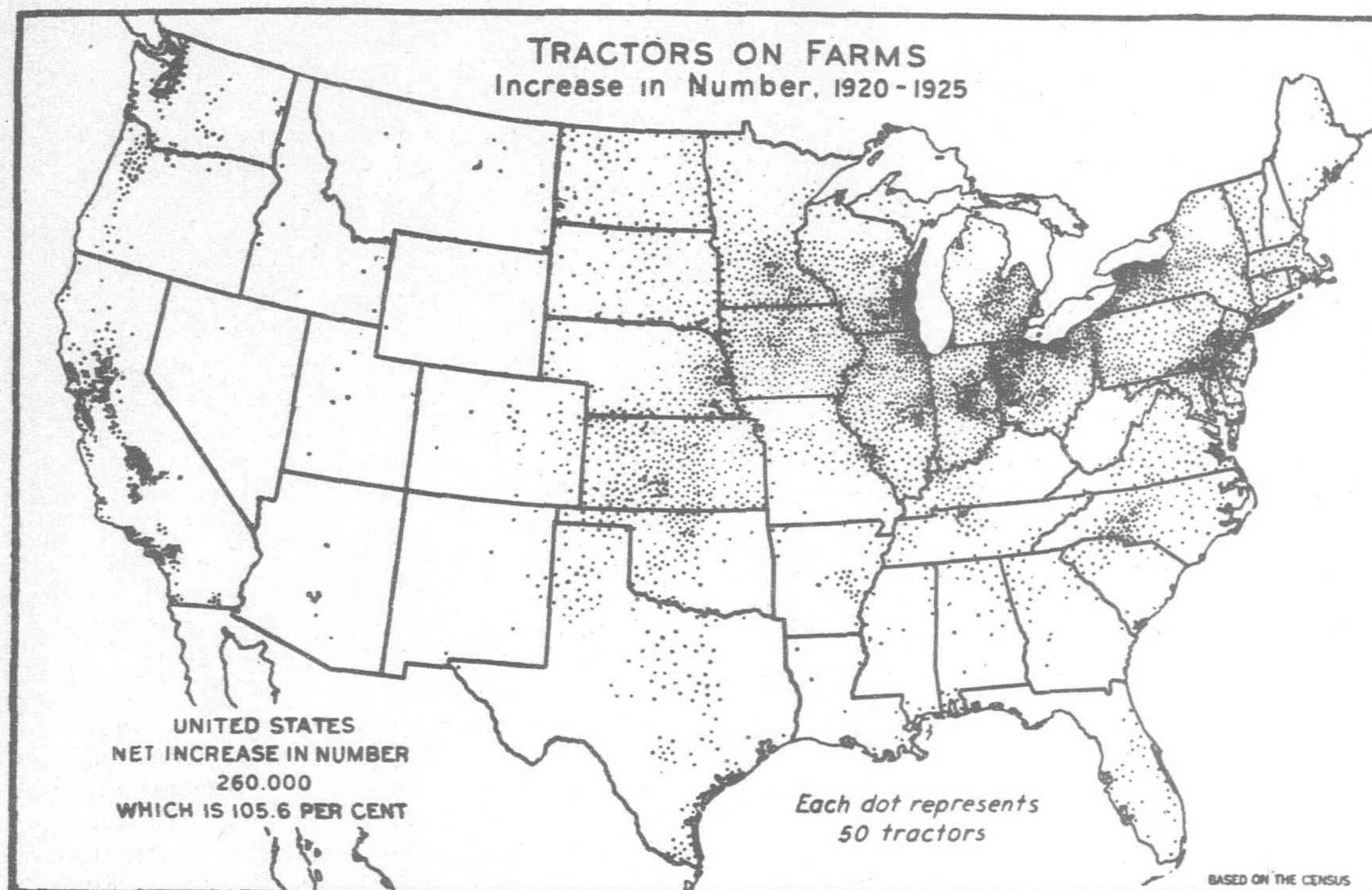


FIG. 5.—The increase in number of tractors between 1920 and 1925 was most notable near the large industrial centers, where wages are high, and was much less notable on the large farms of the central west, where, however, larger tractors are used than in the East.

unison with adjacent parcels farmed by other people and in accordance with tradition.*

With individual control of farm operations thus secured both by landlords and freemen, the adoption of improved methods of production became possible. Turnips were introduced from Flanders and were grown on the fallow of the Medieval three-field system (first year in winter grain, second year in spring grain, third year land lay fallow). This intertilled crop was more effectual than the fallow in controlling weeds and it increased the crop area by a half. Moreover, the turnips and other root crops provided feed for more livestock, and these produced more manure. During the Eighteenth Century also clover was introduced and this crop added both humus and nitrogen to the soil. Whereas in England wheat yields during the Middle Ages did not average over 10 bushels per acre, by the year 1800 Arthur Young estimated the yields at 20 bushels. During the first half of the Nineteenth Century the use of lime and later of nitrate, phosphate and potash fertilizers became common, partly as a result of the work of Liebig, in Germany, and of Lawes and Gilbert, in England. Principally because of the use of animal manures, clover, and mineral fertilizers, wheat yields in England had reached 30 bushels per acre before 1880. Meanwhile, the breeds of farm animals were greatly improved. The amount of meat or milk produced per unit of feed consumed doubtless gradually increased, and at the same time the quality of the product was improved.

During this first half of the Nineteenth Century also the steamship and the railroad locomotive were developed, and these opened up a new epoch in the world's agriculture. Prior to the coming of these modern means of transportation, agriculture had been confined very largely to the

originally forested lands. The forests supplied fuel and building material, and the ever-running streams that are found in forest areas provided drink for man and beast. Most of the grasslands of Europe and Asia, as well as of North America, were grazing grounds for nomads,—Hungarians and Tartars in southeastern Europe, Manchus and Mongols in eastern Asia, Indians and later cattle and sheepmen in western North America. The lack of wood and water prevented the utilization of these grass lands for agriculture, and the establishment of civilization. When Malthus wrote his famous essay a century and a quarter ago, predicting that in the occidental world, as in the oriental, population would soon press upon the food supply, and be limited by war, famine, and pestilence, only a small part of the vast prairies and steppes of southern and southeastern Russia had been broken for wheat; the Hungarian Plain was still mostly a verdant pasture, divided into the large estates of nobles and cattle kings; the prairies and

plains of central and western North America had not yet been crossed by white men, except by a few fur traders; the pampas of Argentina were an unmapped wilderness; and only a fringe of land along the coast of Australia had been explored.

In addition to the development of steamships and railroads, two other great inventions help to explain the agricultural development of these grass-lands and the extraordinary increase of popula-

* This medieval communal cultivation of land is still the common practice in the U.S.S.R. (Russia), and is an important cause of the low crop yields per acre. The co-operative use of tractors and harvesting machinery on these communal fields, however, is opening the way for other improvements in farm practice, that may be as revolutionary as those in England during the Eighteenth Century and earlier.

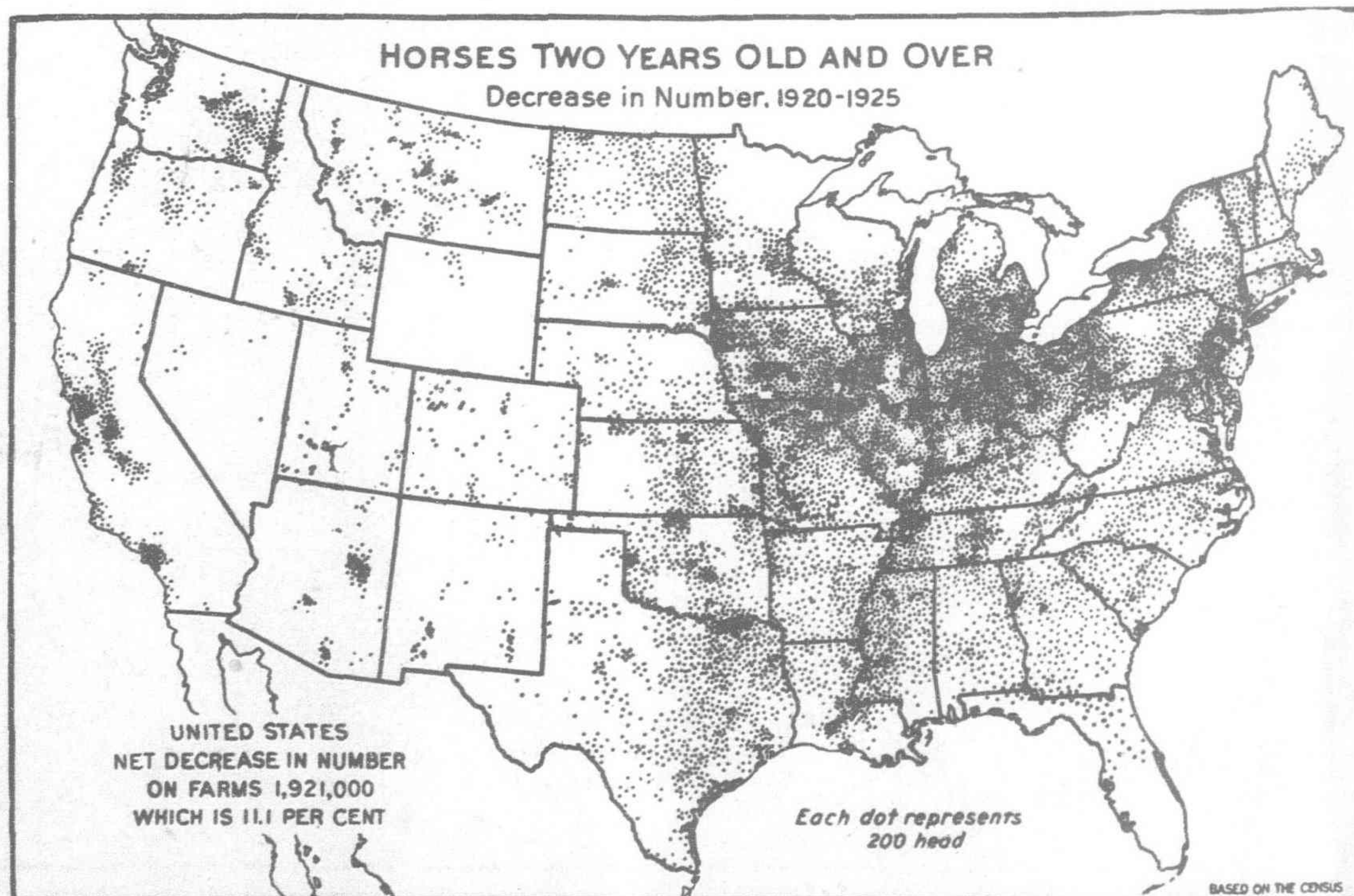


FIG. 6.—The greatest decrease in horses between 1920 and 1925 took place in the eastern and central Corn Belt. Here the increase in tractors was noteworthy, but not so notable as in Eastern Wisconsin and Western New York. There was a large decrease in horses in the South, where there are few tractors, but a notable increase in mules.

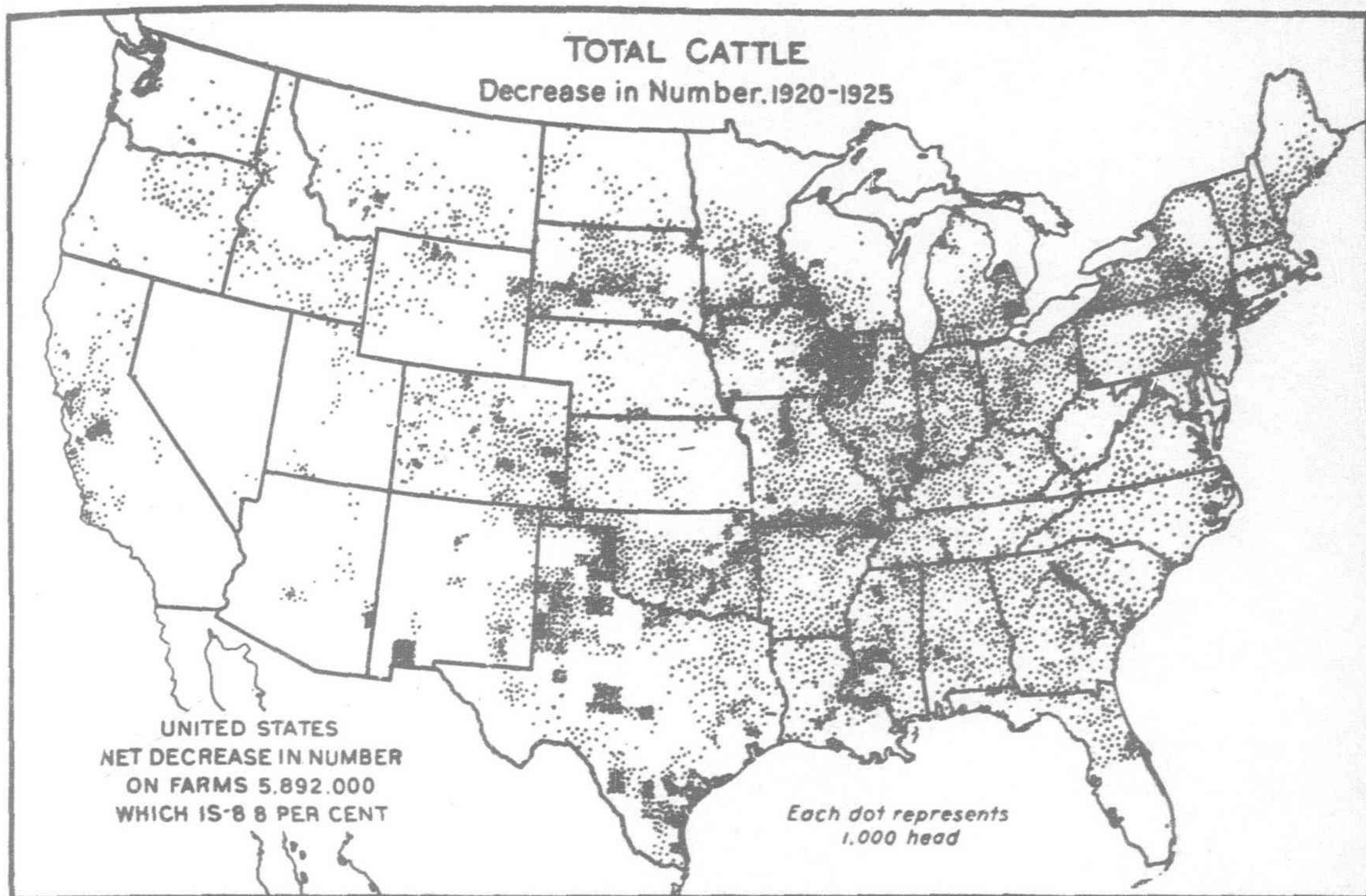


FIG. 7.—The decrease in cattle between 1920 and 1925 was almost universal in the eastern half of the United States, northern Minnesota, Wisconsin and Michigan and southern Florida being the only districts in this vast area that showed an appreciable increase. A notable decrease occurred also in the Texas Panhandle and eastern Colorado and in California and Idaho.

tion and wealth in Europe which has followed,—the invention of well-drilling appliances and the development of grain-harvesting and threshing machinery. Wells gave water to the almost streamless plains, grain-harvesting machinery enabled one man to do the work of five, releasing the other four for labor in urban industries, while the railroads brought wood and coal to the settlers and provided cheap and rapid transportation to market for their grain and other products.

Thus it appears that the advance of science and the resultant development of industry in northwestern Europe, by affording large markets for agricultural products and by providing means of transportation to those markets, has not only increased both the acreage and the acre-yields of the crops in Europe, but also has encouraged the expansion of crop production onto the grasslands of the world, until eastern Europe as well as western North America, even distant Argentina and far-away Australia and New Zealand, contribute to the food supply of western Europe. Secretary Hoover once estimated that a hundred million people in Europe were dependent on other continents for food. In the past this importation has been mostly from the former grasslands of the temperate zones, but in the future it must be more and more from the tropics.

It is evident, therefore, that Europe has much to teach North America with reference to a food supply for the increasing population, and it would appear that the limit of production has by no means been reached in Europe itself. The resources of science and agricultural technique are not exhausted.

These many means by which the food supply of western Europe has been increased are mentioned because some modern economists are prone to think only in the terms of the classical economists. When Malthus and Ricardo wrote their very influential treatises relating to population and the rent of land, the importance of nitrogen and phosphorus and potash in plant production was unknown, not a steamship rode the waves, not a railroad had been built, there was no agricultural machinery in our modern meaning of the word, but only those farm implements that had been in common use since the time of Christ. The milk cow probably averaged not over 2,000 pounds of milk per cow, instead of 5,000 pounds, as in several countries of northwestern Europe and our best dairy States to-day. The point of diminishing returns was more or less fixed, because farm practices were fixed, and not a point receding with each advance in agricultural technique, as is occurring

to-day. Those economists interpreted the economic conditions in their time, but it was a different time from that in which we live, (though, perhaps, the difference is more in degree than in kind).

The Population Problem in Europe

In the trend of birth rates and death rates also Europe differs from Asia. In most countries of Europe a significant decline in the birth rate is in progress. Between the decades 1871-1880 and 1901-1910 the birth rate fell in Germany from 39 to 33 per thousand population, in Austria from 39 to 35, in Italy from 37 to 33, in

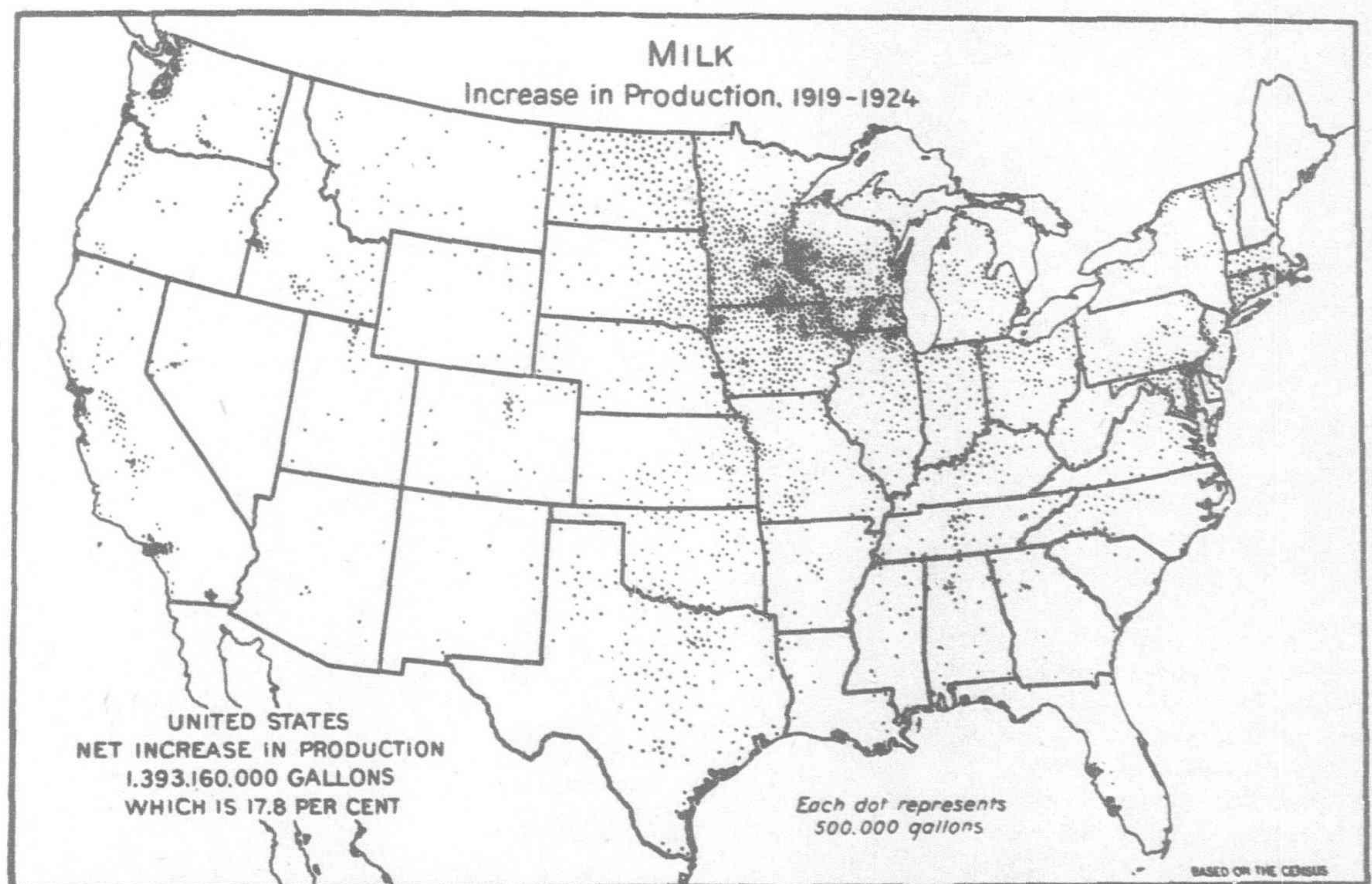


FIG. 8.—Despite the decrease in number of cattle in all the important dairy states except Kansas, Nebraska, North Dakota and Montana, the production of milk was much greater in 1924 than in 1919. This increase was in Wisconsin, Iowa, Minnesota and the Dakotas. However, an increase is indicated for every State in the Union, except Maine, New Hampshire, New York, South Carolina and Georgia.

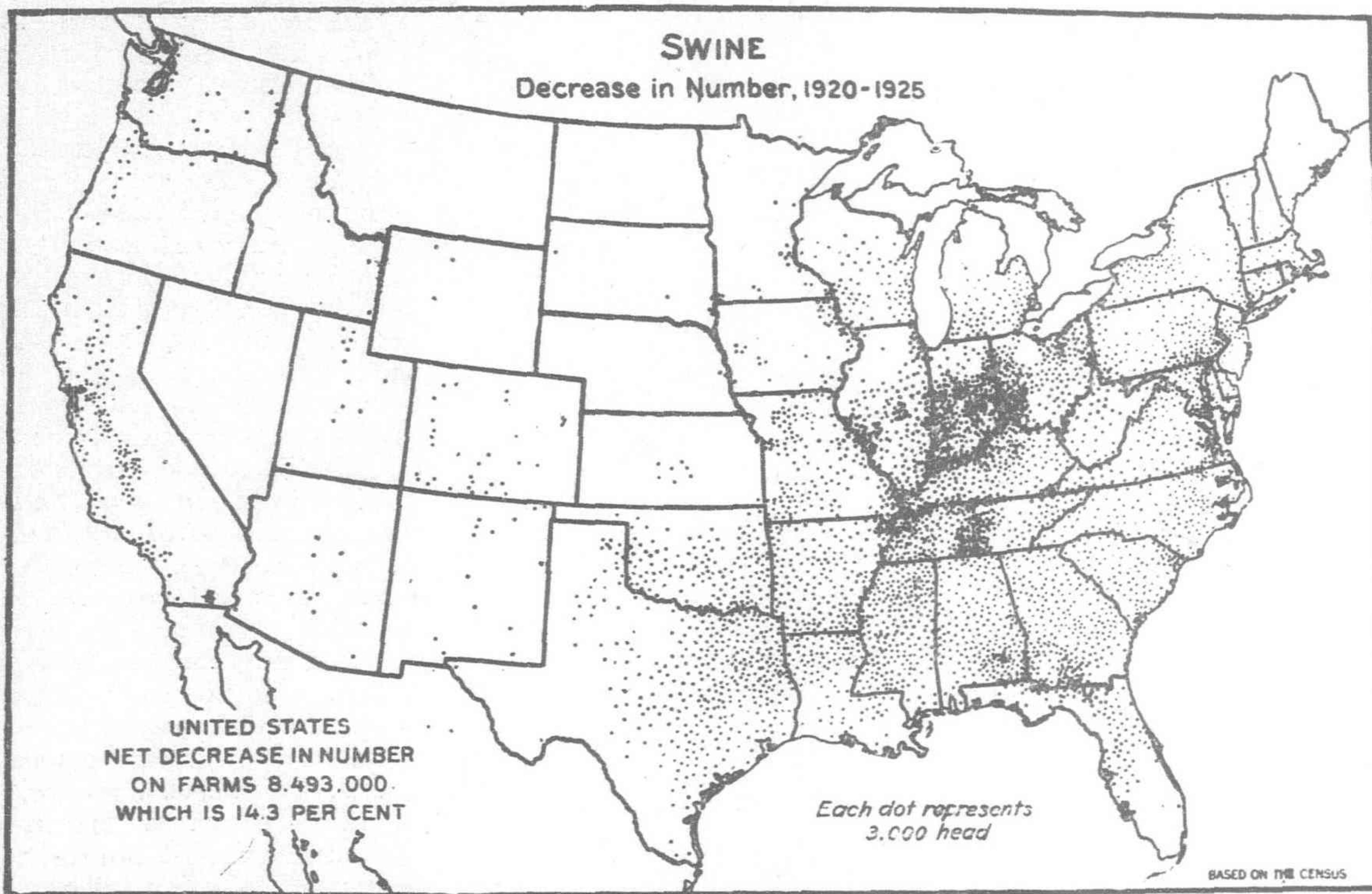


FIG. 9.—The decrease in number of swine between 1920 and 1925 was practically confined to the eastern, originally-forested portion of the United States and the valleys of the Pacific States. These are feed deficit regions usually, except in the eastern Corn Belt. The decrease was greatest proportionately in the South.

Finland from 37 to 31, in Holland from 36 to 30, in England and Wales from 35 to 27, in Scandinavia from about 31 to 27, and in France from 25 to 20. Last year (1926) in England and Wales the birth rate was only 18 per thousand of population, dropping below that of France, and in Germany for several years it has been less than 20 per thousand, or about the same as in France; but, of course, owing to much lower death rates, the natural increase in these countries was much larger than in France. In Italy the decline in the birth rate has been greater in the past twenty years than in the previous thirty years. In Catholic as well as Protestant countries of Europe the birth rate is falling. The death rates have been falling about as rapidly, so that the rate of natural increase has remained stationary, or changed only slightly. But the death rates cannot keep falling continuously, and if the birth rates continue to decline, several other countries, as well as France, will approach a stationary population in a few decades. If Europe can maintain its present rate of increase of both agricultural and industrial production for a half century, the future is full of hope.

The Progress of Population in North America

Nowhere has population increased at a more rapid rate during the past century and a half than in the United States. When our nation declared its independence 152 years ago, there were about 2,500,000 people scattered along the Atlantic Coast from Georgia to Maine. A quarter century later, by the year 1800, population had more than doubled, in a half cen-

tury, by the year 1825, it had quadrupled; and by 1850, it was nine times as large as in 1775. Up till the Civil War, Malthus' statement that given plenty of food and normal freedom from disease, population tends to increase in geometrical ratio, held true. But in the next quarter century a decline occurred in the rate of increase, a greater decline than can be explained by the influence of the Civil War. Population had not doubled by 1875 and between 1875 and 1900 it increased only 73 per cent. From 1900 to 1925, the increase in population was only 50 per cent, and it is now increasing at the arithmetical ratio of about 1,700,000 each year. This growth of the American nation from 2,500,000 to about 119,000,000 people during the slightly more than a century and a half since the Declaration of Independence, with the accompanying increase in wealth and culture, is unparalleled in human history.

But the rate of increase is decreasing. Both birth rates and death rates are falling. However, the death rate, which is now about 11.5 per thousand in the registration area, cannot go much lower, and may become higher. Dividing the 11.5 into 1,000 gives an average age of nearly 90 years, which is far beyond the average age at present, or that which may ever be expected. It is obvious that this "crude" death rate is not indicative of the "expectation of life," and is so low partly because of an abnormally large number of young people in our population. However, a five-year-old child may now expect to live to well past 60. Dublin and Lotka have shown that after the present natural increase rate in the United States, about 10 per

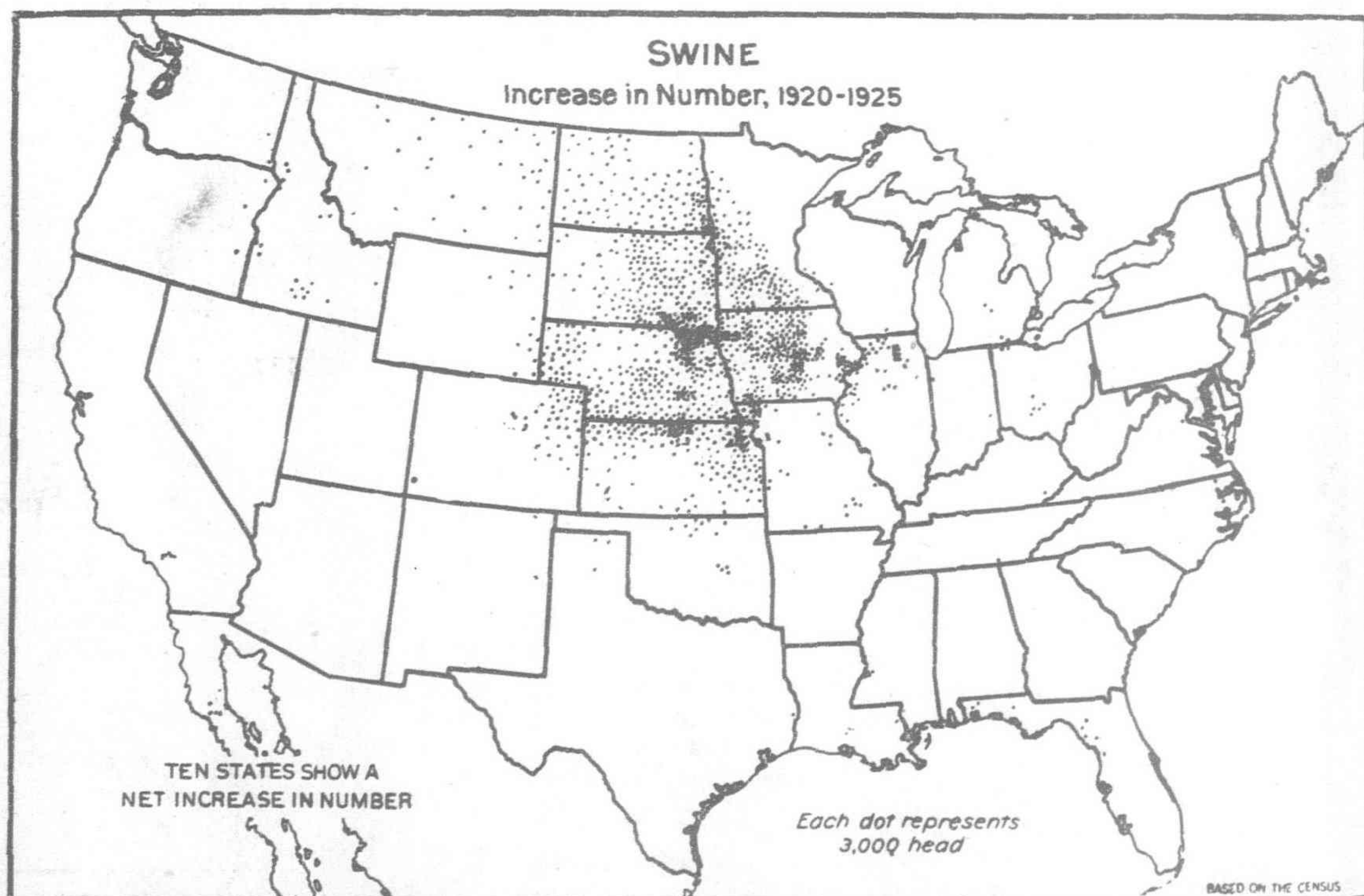


FIG. 10.—The increase in number of swine between 1920 and 1925 was notable in the western Corn Belt and in the Spring Wheat Region to the north. In these States there was an extraordinary shift from wheat toward corn (Figure 12), and the acreage of oats also increased, while the number of horses decreased, and cattle also in parts of the region.

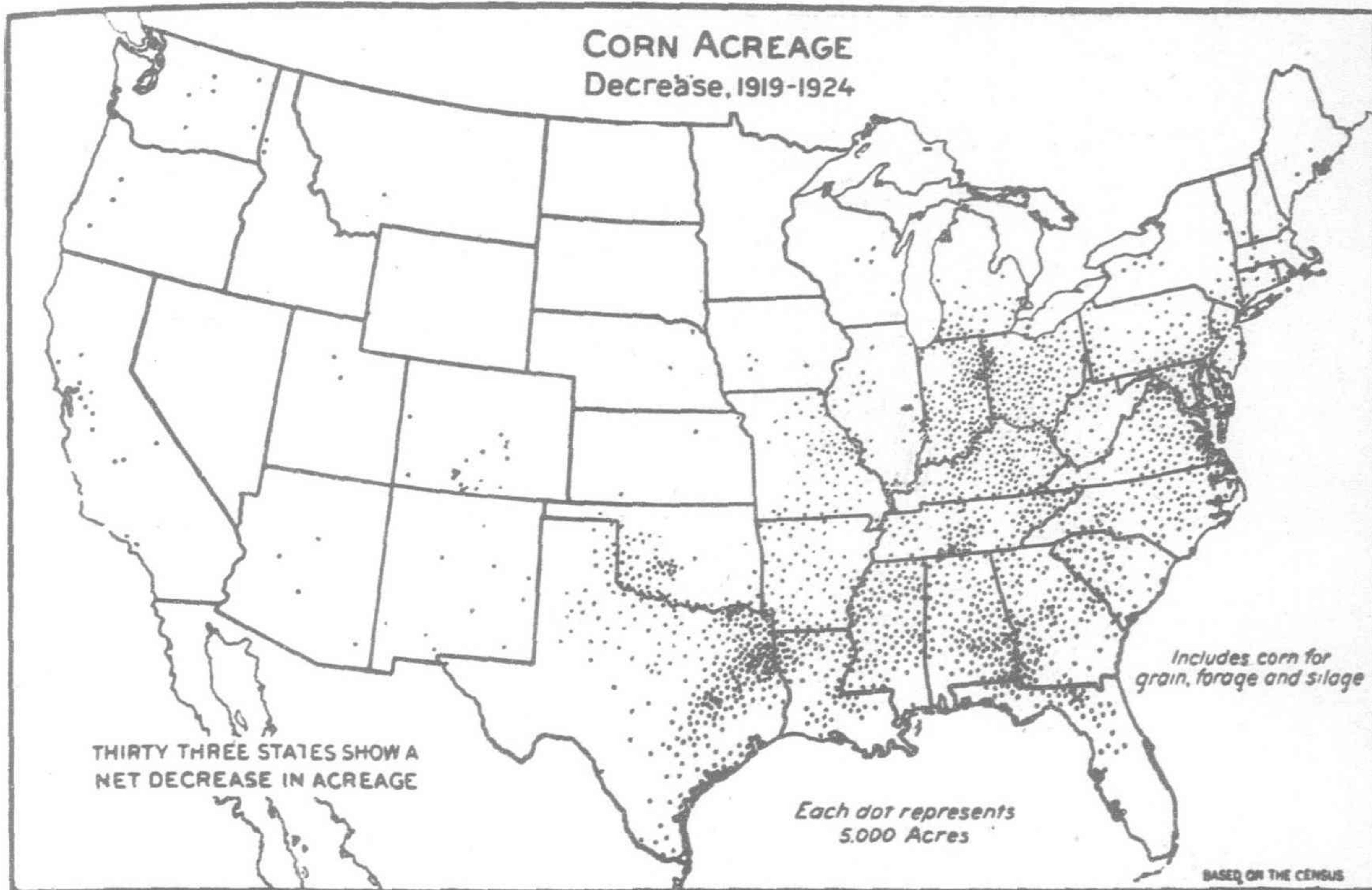


FIG. 11.—The area showing decrease in corn acreage between 1919 and 1924 was almost coincident with that showing decrease in swine (Figure 9), but was not quite so extensive. It was largely confined to the originally-forested portion of the United States, and the decrease was especially great proportionately in the South.

Progress of Agricultural Production in the United States

Has agricultural production in the United States kept pace with the extraordinary increase in population, especially since the fertile western prairies have been occupied and settlement has pressed beyond onto the semi-arid lands of the Great Plains region? It has, viewing the period as a whole. After falling behind during nearly two decades after the year 1900, agricultural production since the World War has increased more rapidly than population. And can agricultural production continue to keep pace with the increase of population until this population of 200,000,000 is reached? Available evidence indicates that it can, though probably a slight change in diet will occur, involving less meat and more dairy products and cereals.

Recently the Division of Land Economics, of the Bureau of Agricultural Economics, has been preparing an index of agricultural production in an effort to understand the present anomalous

thousand, is corrected for the larger proportion of young people in the population at present than there will be in the future, resulting from the fact that the population is increasing at a less rapid rate than in the past and that the large number of immigrants till recently were mostly young people, also because of the decreasing proportion of the population which is rural, the natural increase rate would be reduced to one-half, or to about 5 per thousand.* Moreover, the trend in this rate almost certainly will be downward. It appears not improbable that the population of the United States will reach a stationary stage of 200 million near the year 2,000 A.D. (Figure 4)†. Automobiles and other luxuries are only too successfully competing with children as objects worthy of sacrifice, and, perhaps, in more cases a proper sense of parental responsibility for the education of the children accomplishes the same result.

The trend of population in Canada, though the figures are much smaller, shows a similar but less regular rate of increase. The population in the year 1800 was about 400,000, in 1825 it had doubled, in 1850 it was nearly six times as great as in 1800. But from 1850 to 1875 it increased only about 35 per cent, and the percentage increase was about the same between 1875 and 1900. From 1900 to 1925, however, owing principally to the settlement of the Prairie Provinces, the increase was about 75 per cent. However, in the Prairie Provinces, which are the only provinces of Canada included in the Census of 1926, population had increased only about one per cent. a year between 1921 and 1926, and the number of farms actually decreased.

of Agricultural Economics, has been preparing an index of agricultural production in an effort to understand the present anomalous

* "The Statistician and Population Problem," Journal of American Statistical Association, March, 1925.

† This is the estimate of Professors Pearl and Reed, of Johns Hopkins University, made several years ago. Professor P. K. Whelpton, of the Scripps Foundation for Research in Population, Miami University, in discussing this paper noted that the recent studies made by this Foundation indicated that a stationary population of 175 to 180 millions would be reached several decades before the year 2,000 A.D.

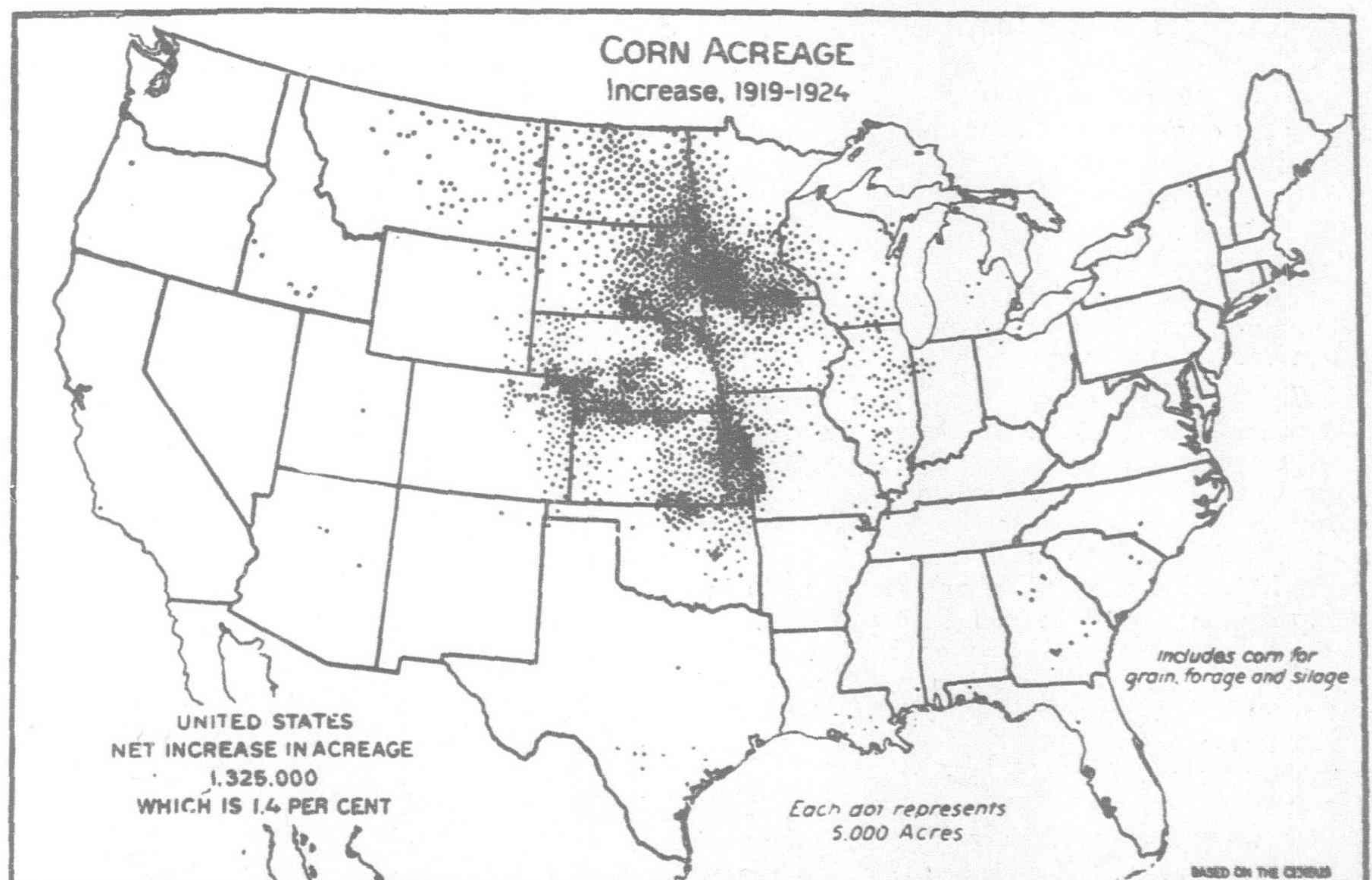
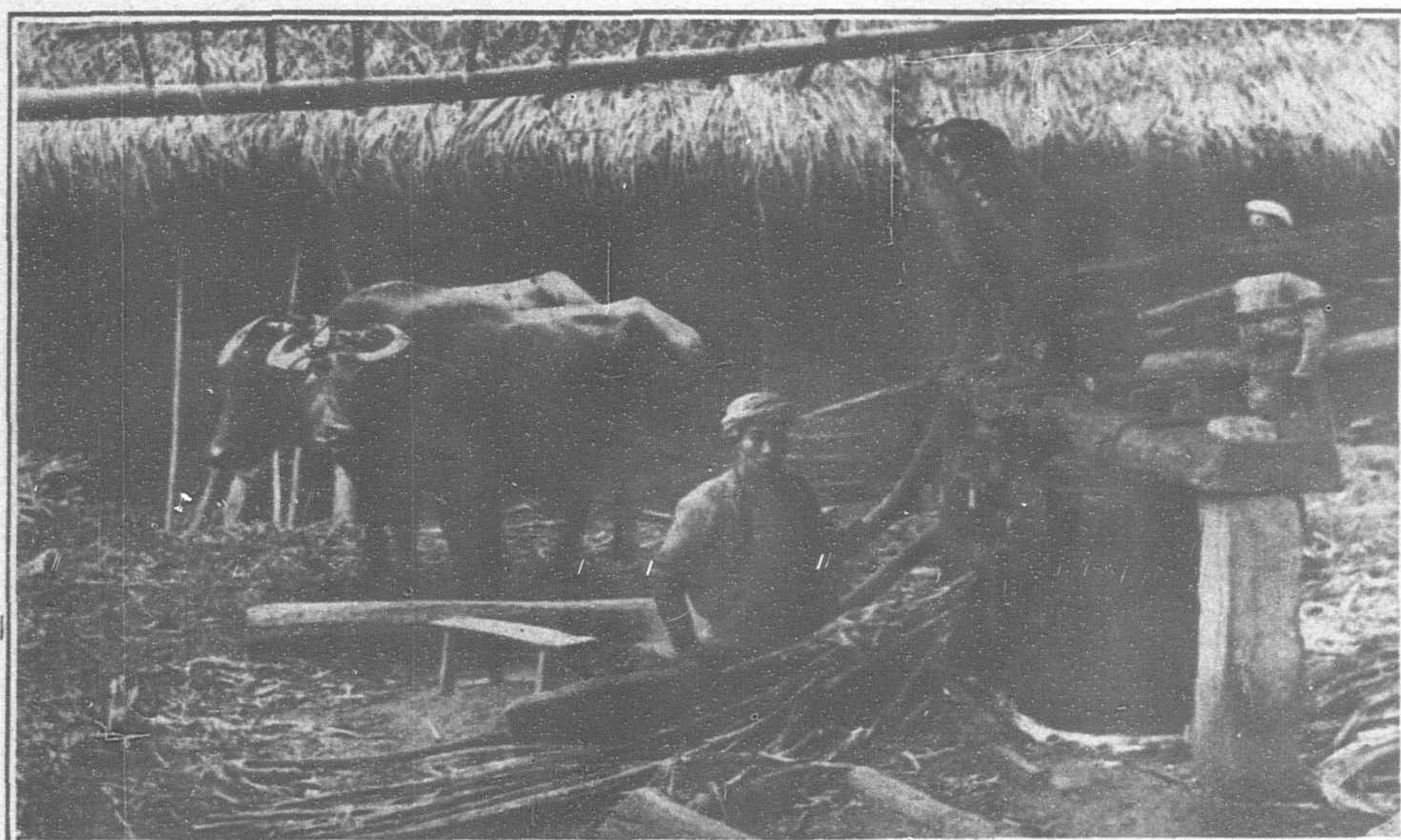


FIG. 12.—In most of this region where the acreage of corn increased between 1919 and 1924, the acreage of wheat decreased notably, and in the Dakotas there occurred also a considerable decrease in hay acreage. Principally as a consequence of the large increase of corn and oats production in this region, the production of pork and lard in 1923 and 1924 was much greater than ever before.



Old Method of Pressing the Sugar-Cane to Get Juice.—Fukien

agricultural situation and anticipate whether there would likely be need for more crop land in the near future. The index consists of the annual production of animal products (beef and veal, pork and lard, mutton and lamb, poultry and eggs, milk, wool and mohair), plus the production of that portion of some 28 crops which was not fed to livestock in the United States. The various items have been combined on the basis of the average farm price during the decade 1917-1926. An index of consumption of agricultural products also is being compiled, but the work is not as far along as that on the production index.

It has proven possible to extend the production index only as far back as the year 1897 with a reasonable degree of confidence, because of lack of adequate data on animal products prior to 1899; but the index of crop production, the prices of agricultural commodities, and the volume of agricultural exports, all indicate that agricultural production was increasing more rapidly than population after the Civil War and up till near the beginning of the twentieth century.

The Changes in Agricultural Production Since 1900

The preliminary figures of this index indicate that the production of milk, and pork and lard, and of potatoes, fruits and vegetables in the United States per capita of the total population was higher in the last 5-year period, 1922-1926, than in the first 5-year period, 1897-1901, or in any 5-year period intervening, except for potatoes.* On the other hand, the per capita production of the following foods decreased: beef and veal combined (beef decreased and veal increased), mutton and lamb combined (mutton decreased and lamb increased), chickens and eggs combined (eggs only slightly), and, notably of wheat and corn used for human food.

With reference to animal products, the per capita production of milk which was about an eighth greater in the period 1922-1926 than in 1897-1901, was balanced by the decrease in per capita production of meat, and the slightly smaller decrease in per capita production of poultry and eggs. The per capita production of wool declined much more, indeed, the production during the period 1922-1926 averaged about the same as in 1897-1901, but meanwhile population increased 50 per cent. With reference to plant products, the per capita production of wheat and also the aggregate of other cereal products used for human food, was nearly a third smaller in the later than in the earlier period. On the other hand, the per capita production of potatoes, and likewise of other vegetables, was nearly a fourth greater in the period 1922-1926 than in the period 1897-1901; and the per capita production of the fruits was, apparently, a fifth greater. The per capita production of cotton during the past decade has been much less than during the previous 15 years, nevertheless was higher in 1925 and 1926 than in any year since 1914. Combining (on the basis of the average farm price 1917-1926 inclusive) the various agricultural products, it appears that production per capita during the period 1922-1926 was slightly less than during the period 1897-1901.

This comparison of the first and the last 5-year period during the thirty years since 1897 is not adequate, indeed, may be misleading, for between these two periods a notable depression in agricultural production per capita occurred. During the period 1902-1906 agricultural production per capita was several per cent. less than in the period 1897-1901; in the period 1907-1911 it was still less, in the period 1912-1916, it was about the same as in the preceding 5-year period; and in the war and early post-war years 1917-1921 it declined to about nine-tenths of the per capita production in the period 1897-1901. Beginning with 1922 the increase in production has been rapid and almost uninterrupted. In the year 1926, for the first time since 1904, the average per capita production of agricultural commodities exceeded that during the period 1897-1901. Data are not yet available for 1927.

The Increase in Agricultural Production Since the World War

It appears that the slower increase of agricultural production than of population after the year 1900, notably during the period 1909-1917, consisted, in large part, of a retarded increase in animal products, notably beef, mutton and wool. Even less increase in production of wheat, rye and corn used for human food had occurred. There was also a relatively small production of cotton during the years 1915-1923. Largely because of this slower increase of agricultural production than of population a rise in price of agricultural products occurred, which was further augmented by the demands of the World War, and, as a consequence, the application of scientific research to agriculture has been stimulated, improved farm practices have been widely adopted, the automobile and tractor have replaced many horses and mules, releasing much feed for meat and milk animals, and agricultural production has recently increased to such an extent that it has overtaken the increase of population. Even before this point was reached, the increasing production, in connection with decreasing exports of wheat and pork and increasing imports of sugar, was sufficient to produce the troublesome post-war surplus. Undoubtedly the various agencies for the promotion of agriculture,—the agricultural press, the farm organizations, the agricultural colleges, extension services and experiment stations, the State departments of agriculture, the U. S. Department of Agriculture and other organizations, supported by stern economic necessity, have been important factors

* Several graphs, based on the preliminary figures, were used to illustrate this discussion; but in view of the fact that the final index data will soon be ready for publication, these hastily prepared preliminary graphs are not reproduced at this time.



Hulling Seed in Man-power Mill



A Cantonese Farmer.—One of Those Who Make Up China's Hidden Strength

in effecting the adoption of improved agricultural practices and types of farm animals at a more rapid rate, probably, than in any previous period of our history.

Agricultural production as a whole was over 14 per cent. greater in the period 1922-1926 than in the period 1917-1921, whereas population increased less than nine per cent. between the mid-years of these two 5-year periods; in other words, the increase of agricultural production was over 50 per cent. greater than the increase of population.

More surprising than this rapid increase in production and resultant surplus, however, is the fact that this condition has developed despite a decreased, or at least stationary, acreage of crop land. The census of 1925 shows a decrease of about 13,000,000 acres in the area of crops harvested between 1919 and 1924, the first decrease shown by any census in our national history; while the average of the estimates of the Division of Crop and Livestock Estimates for the five-year period 1917-1921 as compared with 1922-1926 indicate a decrease of 1,000,000 acres. Moreover, the acreage of pasture in farms has decreased (but not total pasture), and the number of horses and cattle and hogs has decreased notably; indeed, beef cattle are less numerous than at any time during the past 40 years, and there are about the same number of hogs in the United States as 40 years ago. Furthermore, the number of farms has decreased since the World War years, the farm population and number of farm laborers has decreased even more, and the average acre-yield of the crops has increased only slightly.

This increase in agricultural production since the World War, despite a decrease in crop land and in number of livestock on farms, is owing primarily: (1) to the release for other uses of 15 to 20

million acres of crop land formerly required to feed the horses and mules which have been replaced by tractors and automobiles; (2) to increasing efficiency of production, especially in the amount of milk and meat produced per unit of feed consumed; and (3) to a shift from the less productive classes of animals per unit of feed consumed toward the more productive (*i.e.*, from beef cattle to dairy cattle and swine), and from the less productive crops per acre toward the more productive (*i.e.*, less wheat and more corn in the North, less corn and more cotton in the South, and more vegetables and fruits especially in California and Florida.)

The Increase in Animal Products Since the War

About two-thirds of the increase in agricultural production is assignable to the increase of animal products. A study of available data indicates about four per cent. more dairy cows and heifers on farms January 1 in the period 1922-1926 than in the period 1917-1921, but that probably 20 per cent. more milk was produced; about five per cent. fewer total cattle, but that six or seven per cent. more beef and veal was slaughtered. However, after allowance is made for the depletion in number of beef cattle, there is no indication of a notable increase in production of beef and veal per animal on farms January 1. With hogs, however, as with dairy cows, the increase in production per head has been very large. There were about the same average number of hogs on farms January 1 in the period 1922-1926 as in the period 1917-1921, according to the estimates of the Bureau of Agricultural Economics, but the increase in pork and lard under Federal inspected slaughter was 25 per cent. Undoubtedly the inspected slaughter of hogs has constituted a larger proportion of the total slaughter in recent years, so that the increase in total production of pork and lard has been considerably less. It was about 20 per cent. according to the estimates of the Bureau of



The women especially are skilled rice planters, that is they gather the young rice by handfuls from the prepared beds and plant it stalk by stalk, just so many inches apart in the big fields, then tend it carefully until ready for the reaping.

Animal Industry.* There were somewhat fewer sheep on farms and ranges in the period 1922-1926 than in the period 1917-1921, nevertheless, over 10 per cent. more mutton and lamb was produced. Increase in production per animal is, of course, greater than increase in production per unit of feed consumed, but after allowance is made for the feed released by the decrease in horses and mules, and for the shift from the less productive beef cattle toward the more productive dairy cattle and swine, it appears that the production of animal products in relation to feed consumed by the animals increased in the neighborhood of seven per cent. between these two 5-year periods.

Many factors have contributed to this increase in production of animal products per unit of feed consumed. One of the most important has been the more rapid mechanization of agriculture and decrease in horses and mules in the Northern and Western States than in the Southern States. (Figs. 5 and 6). In fact, the increase in mules in the Southern States between 1920 and 1927 partially balanced the decrease in horses, so that the net decrease in horses and mules was only 11 per cent, as compared with 20 per cent. for the Northern and Western States. The large increase in feed available for meat and milk animals in the Corn Belt and in the States to the north and west has resulted in a much smaller decrease in cattle in these States than in the South, accompanied by a large increase in milk production. (Figs. 7 and 8), and in a notable increase in number of hogs in many of these Northern and Western States, as contrasted with a very great decrease in the South (about 40 per cent). (Figs. 9 and 10). In general, the cattle and hogs are much more productive both per head and per unit of feed consumed in the North and West than in the South, and as the acre-yields of the feed crops are also much higher, there has resulted not only an increased production of meat and milk in the United States per unit of feed consumed, but also an even greater increase of production per acre of crop land.

Another, and perhaps almost as important, cause of the increase in animal products per unit of food consumed has been the slaughter at an earlier age. Younger animals make more rapid gains on the same amount of feed than older animals. The number of calves slaughtered is now over half as great as that of older cattle, whereas a decade ago it was less than one-third, and the slaughter of yearlings has also increased rapidly. Deaths from disease also have diminished, particularly in the case of hogs, owing to better sanitation and less losses from hog cholera. Better feeding, especially the greater use of legumes, has been another factor. But probably as important as any factor has been the wider distribution of superior stock. High producing animals reduce the amount of feed as well as labor per unit of product. It requires only about 50 per cent. more labor to care for a dairy cow giving 10,000 pounds of milk a year than to care for a cow giving 5,000 pounds, and the amount of feed consumed by the more productive cow is not 100 per cent. greater, but also only about 50 per cent. greater, according to 100,000 cow testing records compiled by the Bureau of Dairy Industry. However, it would be fairer to compare high producing herds with low producing herds, and when this is done it appears that the increased production per unit of feed will not exceed 25 per cent.†

Probably no more significant development is occurring in American Agriculture than this increasing efficiency of meat and milk animals in transforming feed into food. Of the 16 per cent. increase in production of animal products between the 5-year periods, 1917-1921 and 1922-1926, indicated by the estimates of the Department of Agriculture, about two-fifths is assignable to the feed released by the decline in number of horses and mules, less than one-fifth to the shift from the less productive animals toward the more productive (from beef cattle toward dairy cattle and hogs), and fully two-fifths to the production by each class of animals of more human food per unit of feed consumed.‡

Changes in Crop Production Since the War

Similar changes have occurred in crop production, but not of so great magnitude from the standpoint of economy in use of the land. Comparing the period 1917-1921 with 1922-1926, total crop production (including crops fed to livestock) increased about five per cent. while the aggregate acreage of the crops decreased slightly. However, only about one-third of this increase of five per cent. in production per acre is owing to higher acre-yields of the several crops, two-thirds being due to shifts from less productive to more

productive crops per acre. In the Cotton Belt, for instance, except in Georgia and South Carolina, there has been a very notable shift from corn to cotton, which yields a much higher value per acre, (Fig. 11.) In the western Corn Belt and Spring Wheat region there has occurred a marked shift since the war from wheat to corn, which has a higher acre value (Fig. 12); and in California and Florida especially there has been a large increase in the acreage of the fruits and vegetables, which have a very high value per acre.

Changes in Production per Man Since the War

As the quantity of labor engaged in agriculture decreased probably between two and six per cent. it appears that there was an increase of between seven and 11 per cent. in crop production per unit of labor available.§ It is probable that the real increase in efficiency was much greater than this, and that some labor which formerly was devoted to crop production has been required to produce the large increase in animal products. Recalling the net increase in agricultural production of over 14 per cent, and estimating the decrease in labor on farms at four per cent, it appears that between the period 1917-1921 and the period 1922-1926 agricultural production increased in the neighborhood of 18 per cent. per unit of labor employed.

This probably unprecedented increase in labor efficiency is owing not only to more productive livestock and crops but also to the use of more power on farms. The number of horses and mules two years old and over on farms decreased from 21,873,000 on January 1, 1920 to 20,619,000 on January 1, 1925; but during these five years the number of tractors on farms increased from 246,000 to 506,000. These 260,000 more tractors had a rated tractive horse power of, probably, 3,000,000, to which perhaps 4,000,000 more horse power should be added for the increase in auto trucks, and 2,000,000 horse power for the increase in stationary gas engines and electric motors on farms, in all, an increase of about 9,000,000 horse power of mechanical origin, not including any increase in automobiles.¶ Although this figure cannot be compared directly with the 1,250,000 decrease in horses and mules, it seems safe to say that in this five-year period there was several times as much increase in mechanical horse power on farms as there was decrease in animal horse power.

* It appears doubtful that an increase of 20 per cent. in production of pork and lard per hog on farms January 1 could take place in five years, despite the extraordinary shift in regional production. It is possible that the estimate of the Bureau of Agricultural Economics as to number of hogs on farms was too high in the earlier period or too low in the later period. However, the Census reports a decrease of 8,500,000 hogs between January 1, 1925, and January 1, 1926; whereas the estimates of the Bureau of Agricultural Economics for these dates indicate a decrease of only 4,000,000 head. It is possible, on the other hand, that the estimates of total production of pork and lard are too small in the earlier period or too large in the later period. But nearly two-thirds of these estimates are made up of statistics of inspected slaughter, which are above challenge; and it does not appear likely that uninspected slaughter could have been much above the estimates made by the Bureau of Animal Industry for the earlier period, or below the estimates for the later period.

† Incomplete results of tabulations being made by the Bureau of Dairying indicate that herds (including calves, heifers, dry cows, steers, and bulls) in which the cows milked average 10,000 pounds of milk per year consume between 75 and 80 per cent. more feed than herds in which the average animal production of milk per cow milked is 5,000 pounds.

‡ These proportions are based on preliminary estimates, and are only approximate. The method of estimating will be described in a bulletin on changes in land utilization since the World War under preparation.

§ The decrease in farm population was about six per cent.; the decrease in month's of labor engaged in agriculture was about two per cent. This month's of labor figure consists of the number of farmers, according to the census of January 1, 1920, and of January 1, 1924, multiplied by 12, plus the months of hired labor derived by dividing the cash expenditures for labor, as given by the Census for each State in 1919 and 1924, by the average cash wage in each State in these years respectively, based on reports from many thousand reporters of the Bureau of Agricultural Economics. It has been assumed that the unpaid family labor about balanced the time during the year that the farmer does not work, but it is probably larger. It is also doubtless decreasing, as indicated by the decreasing size of the farm family. This decrease between 1919 and 1924 explains in part the discrepancy between the two per cent. decrease figure for months of labor employed in agriculture and the six per cent. decrease in farm population. It appears probable that the quantity of labor employed in agriculture decreased about four per cent. between 1919 and 1924.

¶ "An Appraisal of Power Used on Farms in the United States," by C. D. Kinsman, U. S. Department of Agriculture Bulletin 1348, page 6 (data used in graph). The figure on horse power developed by tractors has been reduced below that given in this bulletin, also the estimates for increase in stationary gas engines and electric motors on farms are smaller than those given in this bulletin.

Looking Ahead

This substitution of mechanical for animal power on farms must continue for several years at least, for the number of horses and mules being raised on farms are sufficient to replace only about half the horses and mules that die annually. In addition, it should be recalled that cost of production surveys indicate that somewhat higher acre-yields of the crops will be profitable even at present prices. The more widespread use of highly efficient farm animals probably would be even more profitable. If only 50 per cent. more feed is consumed by cows giving 10,000 pounds of milk a year than by giving 5,000 pounds, or even if the increase is only 20 or 25 per cent. when the entire herds are compared, the possibility of a large increase in production of milk without any increase in crop acreage or in yields per acre becomes apparent. A similar, though probably smaller, increase in efficiency of swine, of sheep and of poultry is in progress and will doubtless continue for several years at least. These and many other improvements in agricultural production that are taking place indicate that crop acreage is likely to expand very slowly, perhaps not at all, in the next few years.

And looking forward a century, when our population appears likely to have become stationary, all the evidence available suggests that agricultural production can keep pace with the increase of people without much greater change in the character of the food supply occurring than that which has occurred during the past century. Doubtless there will be some decrease in the per capita consumption of meat, especially beef, accompanied, probably, by a corresponding increase in consumption of milk, cereals, vegetables and fruits; but this will be merely an adjustment to an urban manner of life on the part of an increasing number of people, such as has been in progress for several decades.

This confidence, however, in the capacity of American agriculture to increase the food supply as rapidly as population increases during the next century assumes that the advance of scientific knowledge, in the experiment stations and elsewhere, and the spirit of progress among farmers will continue; also that at least the present degree of general intelligence among urban dwellers will be maintained. Should these bases of our civilization be impaired, agricultural progress might cease and population proliferate, as it has in the Orient, until poverty and ignorance overwhelmed our nation also.

We should always realize that our civilization is based upon science, and that science is the fruit of freedom of thought and conscience. We may have confidence in the minds of men, and even more in the social and intellectual aspirations of women, to solve the problems of population as they arise, provided these minds and aspirations can be kept active and unbiased by dogmas derived from the pre-scientific ages when death rates were thrice as high as now and depopulation was always imminent.

Food Supply and War

In conclusion, may we note one other observation,—that certainly so far as North America is concerned and less certainly with reference to Europe, the progress of agricultural science and practice, in association with the decreasing birth rate, is removing much popular misapprehension with reference to the food supply as a cause of war. Such misapprehension is based on the reading of ancient rather than modern history. It has been remarked recently. "What achievement of our mechanical and industrial age is more distinctive than that it has relegated food, *i.e.*, food as nourishment, to a subordinate place among the objects for which men labor."* Although this is not true of many peoples of the world, it is true of nearly all those who have applied science to agriculture and have entered the industrial age.

The future food supply of the American people seems assured, both with regard to quantity and variety, for at least a century, probably permanently; and if the present trends in agricultural production and population in Europe continues, that continent, it would seem, need not be anxious, provided commerce is carried on with the rest of the world. The per capita consumption of food in the United States, and probably in Canada also, was never so high as at present, both with respect to quality and variety; and in Europe it is now approaching the unprecedented standards attained just before the World War. The prospect in the Orient is less promising, but the possibilities of increase in agricultural production are still great, notably in China. In Japan, the only oriental

country for which such information is available, the standard of living has risen greatly during the past 50 years, and it is to be hoped that the rest of the World will by tariff policies help rather than hinder Japan in its development of manufacturing, through which alone, apparently, it can continue to raise the standard of living of its people.

There is less reason than ever before for nations to conjure up the excuse of food supply as a cause of war. Indeed, in practically every country engaged in the World War, the food supply decreased during the war period much more rapidly than population. Population decreased only in Russia and France, whereas the food supply decreased notably in every European country participating except, possibly, in Great Britain. War offers no solution to the problems of increasing population but, instead, accentuates the difficulty. The solution, in the future as in the past, will be found in the progress of science and its application to agriculture, industry and transportation, and in the lowering birth rate which accompanies the scientific and humanitarian attitude toward life.

* Mark Jefferson: "Looking Back at Malthus," *Geog. Rev.* Vol. 15 April 1925, p. 184.

Construction Enterprises in South-west China

(Continued from page 406)

With this first trunk line of motor road completed, Kweichow will become more a part of commercial China than it has seemed to be heretofore. It will also become better known as a health resort for those who need to get up into the mountains. Its mineral wealth will be developed, for it has coal and iron in abundance, beside many other metals. Then the line to the south-east will become almost a necessity in order to get in foreign-made goods at a low price. That road will strike the Kwangsi border near Lipo and go on to Liuchowfu and on down the West River to Wuchow. Kwangsi is now doing its share in road building under most able management and the rivalry may well continue until such time as cars can run from Canton through Kweiyang to the Yangtze.

Roads to the east and west from Kweichow's capital will follow in a few years—perhaps within the next two years. They are costly and require man power in which this province is not over-supplied. The movement has been started, however, and will be given every encouragement by the Famine Commission as well as local officials. It is the plan of the writer again to go into that province this fall to assist further in a work that appears now much more feasible than it did a year ago before a careful investigation had been made of the conditions. The most hopeful sign of all was the intense enthusiasm of the Governor of the province and the loyal support he seemed to be given by the people generally. We need more of such a spirit. For it permits united effort in making it possible to construct public utilities where the whole community will benefit. In Kweichow and Kwangsi this spirit is very evident. Yunnan, though less enthusiastic, will follow.

A two day trip by boat to the south took us to Lu Liang where another flood problem is being studied. Thirty *li* below this place a narrow rocky gorge blocks the river's discharge in high water. Just how much the backwater from this flood choked gorge affects Lu Liang can only be determined after careful study by men who understand the laws of hydraulics.

We reached Lo P'ing, two days west of the Kweichow border, on November 20, and spent two days here investigating the irrigation project that had recently been surveyed. Here at a proposed cost of half a million dollars water from a small river is to be diverted into a canal that will follow the sidehill for over 60 *li* and then enter a tunnel through the range separating this valley from the Lo P'ing plain. This scheme is to furnish water to supplement the rainfall and thus increase the area of arable land around Lo P'ing. The engineering studies are being continued. An inverted siphon across the Hsi Chu Hsi valley will save several miles of canal and many feet of drop so that at the point of delivery there will be a distinct gain in elevation for putting water into the Lo P'ing plain. Costs of such a siphon are being investigated. Transportation five days overland on mule back makes iron or steel pipe out of the question for the present. The nearest rail point is I-Liang, south-east of Yunnanfu, the trail on to the east to Lo P'ing being steep and difficult in many places.

First Subway in Orient Opened in Tokyo

TOKYO, the first city of the Orient to adopt the subway as a means of solving traffic problems, opened the first link of an underground system to the public at the end of December, 1927. The enthusiasm of the populace over the inauguration of what was to them a most novel scheme of travel was so great that close to 100,000 passengers crowded the trains and stations on the opening day, and many rode repeatedly back and forth.

The new subway connects two thickly-populated sections of Tokyo for which surface lines had become inadequate, the terminals being at Ueno and Asakusa. In its construction and equipment, the engineering features and general appearance are very similar to those of the subways of New York City. The excavation was open cut, roofed over with steel. It is of rectangular section and is located comparatively near to the surface. The stations even to the set spaces for advertising on the walls, are like those of New York City, and similar turnstiles of the coin-in-the-slot type are used.

Ten all-steel cars make up the initial rolling stock. These were built in Nagoya by the Nippon Sharyo Kaisha and their motors and control equipment were made by the General Electric Company of America. The seats are longitudinal and ample provision is made for the rush hour strap-hanging public by enameled metal hand loops overhead which swing away from the center of the aisle when not in use. Iron posts in the aisle are a further aid to personal equilibrium. Each car accommodates 40 seated passengers and 80 standing.

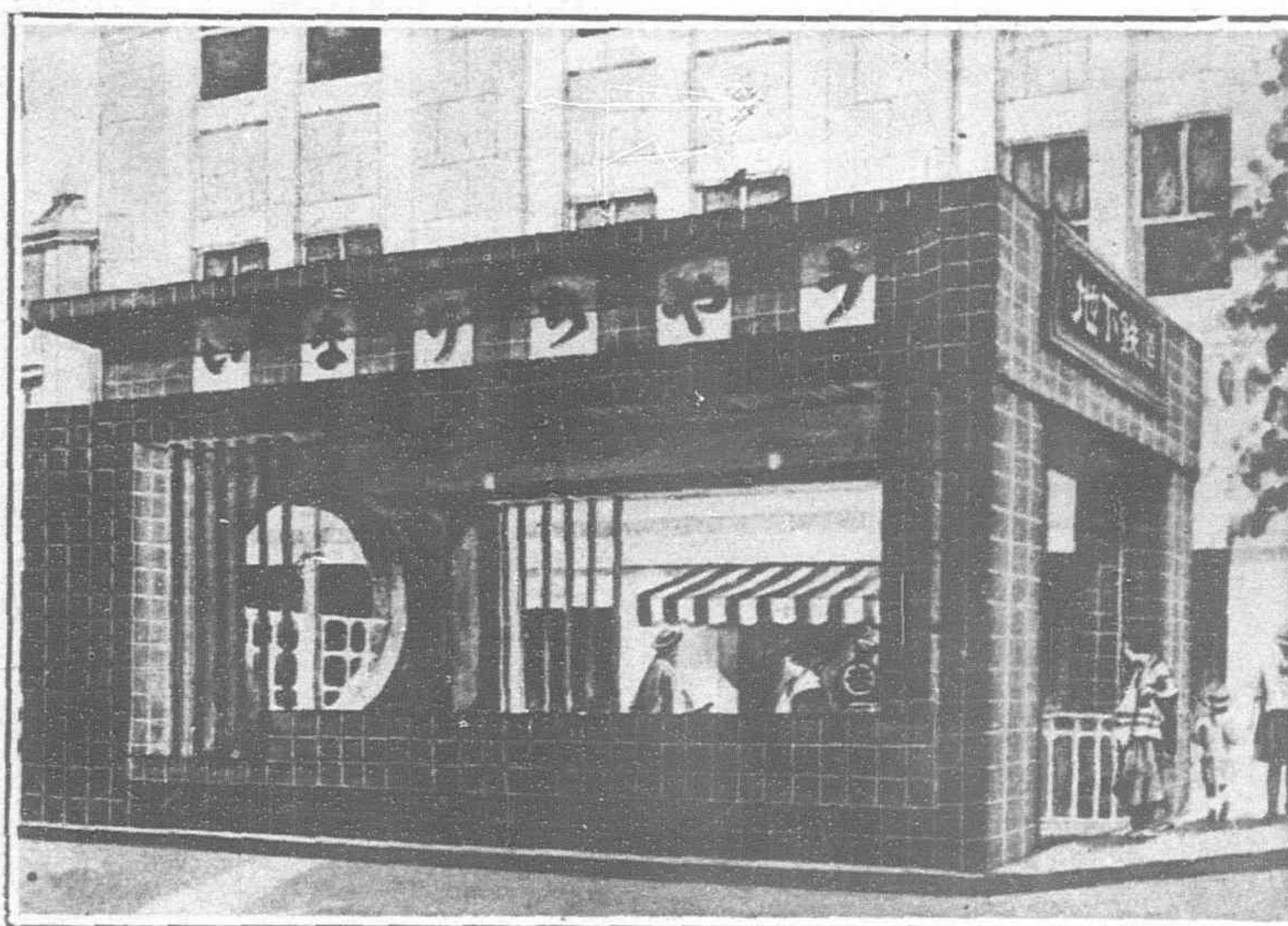
The subway was built by the privately owned Tokyo Underground Railway Company, and nine other sections are under con-

templation by the municipality. The service will be extended into and across the entire city.

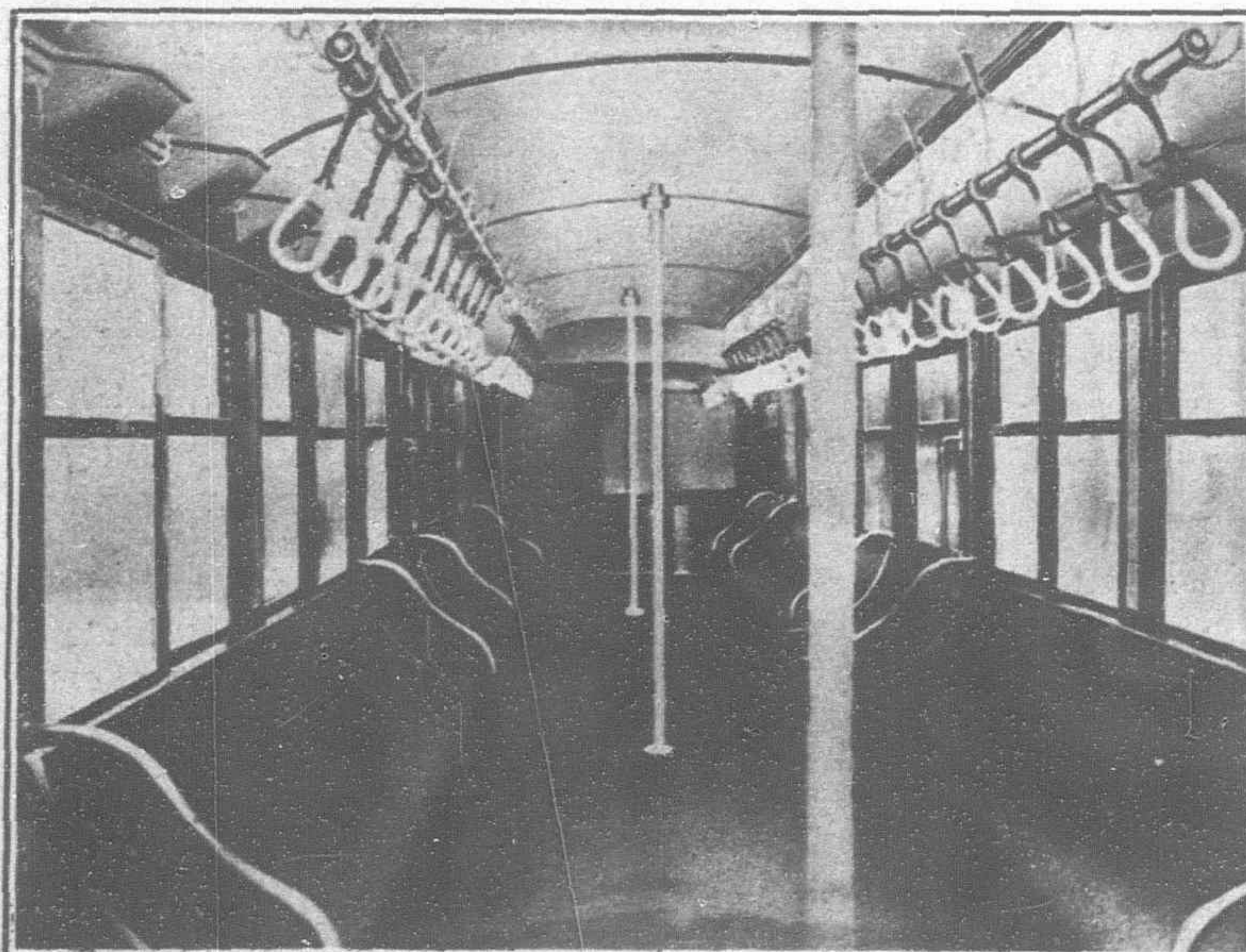
Mr. T. Hayakawa, managing director of the subway company, advocated an underground railway for Tokyo some 14 years ago, but it was not until September, 1925, that construction began. The first section, now in operation, is about a mile and a half in length with two intermediate stations. It is double tracked with 100-pound rails, 4 feet 8½ in gauge. The dimensions are 12 feet height from rails, 24 feet width, increasing to 36 feet at the stations. Each of the cars has two 120-horse-power General Electric motors, and the maximum speed is 35 miles per hour, the schedule speed being 15½ miles per hour. Lighting equipment and accessories were furnished by the Tokyo Electric Company.

Two 1,000-kilowatt rotary converters in the substation supply the 600-volt direct current. The transformers were supplied by the Shibaura Engineering Works. To ensure continuous operation the substation is provided with two different sources of power supply and the lighting and signal equipments have three sources of supply. The possibility of earthquake disturbance received due consideration in the planning and extra precautions were taken by giving liberal dimensions to beams and concrete walls.

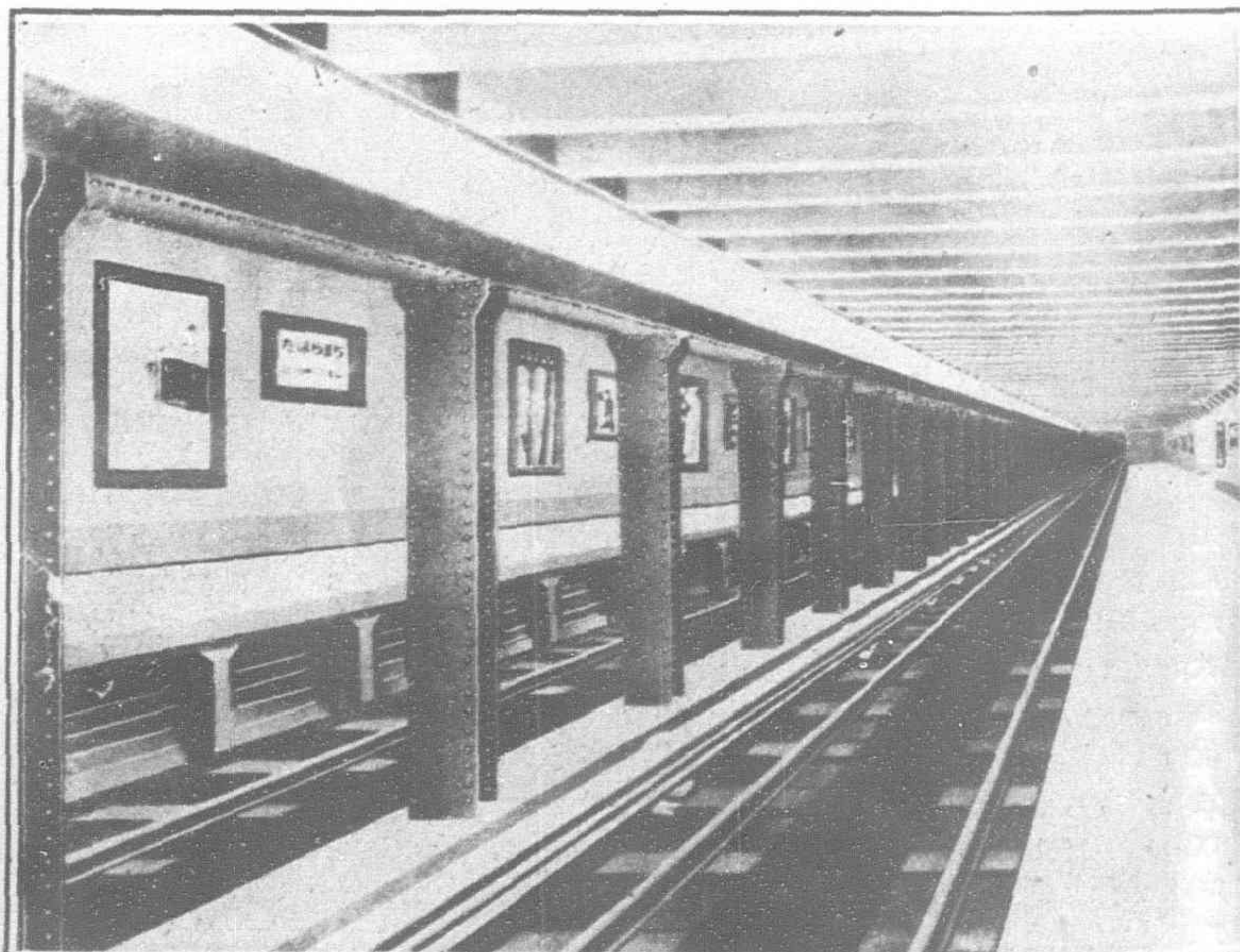
Both terminals of the completed subway, Asakusa and Ueno, are popular pleasure resorts. The second link, of about the same length as the first, will approach the center of the city from Ueno and is now under construction. When the other sections under contemplation are finished the entire city will be traversed and traffic will be facilitated between the outskirts and the business center of Tokyo.



Entrance to the Subway, Tokyo, Japan



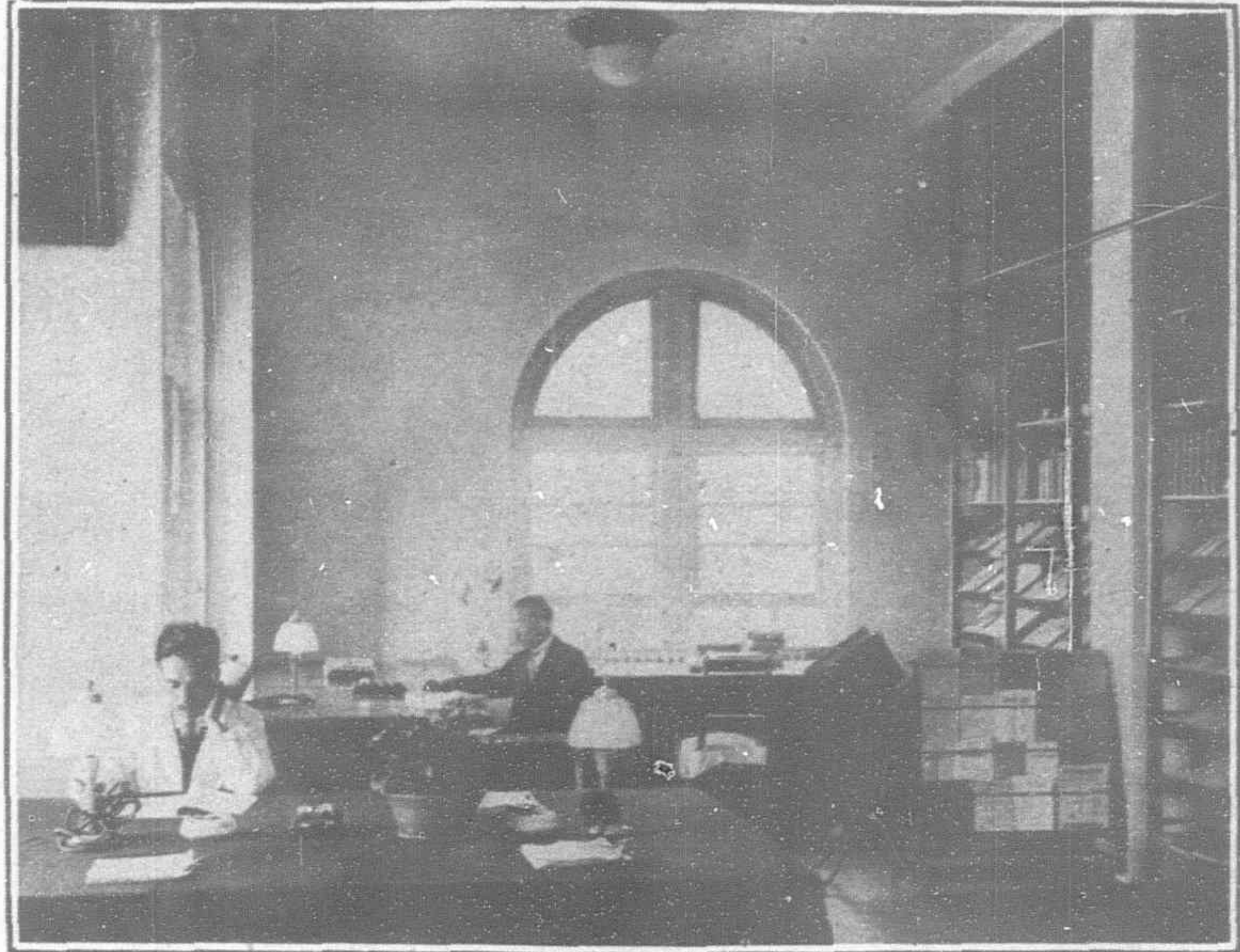
Interior of Typical Subway Car, Tokyo, Japan



Station in the Tokyo Subway, Japan



The Main Entrance is at the Rear



The Reference Library

The New Dairen Hospital

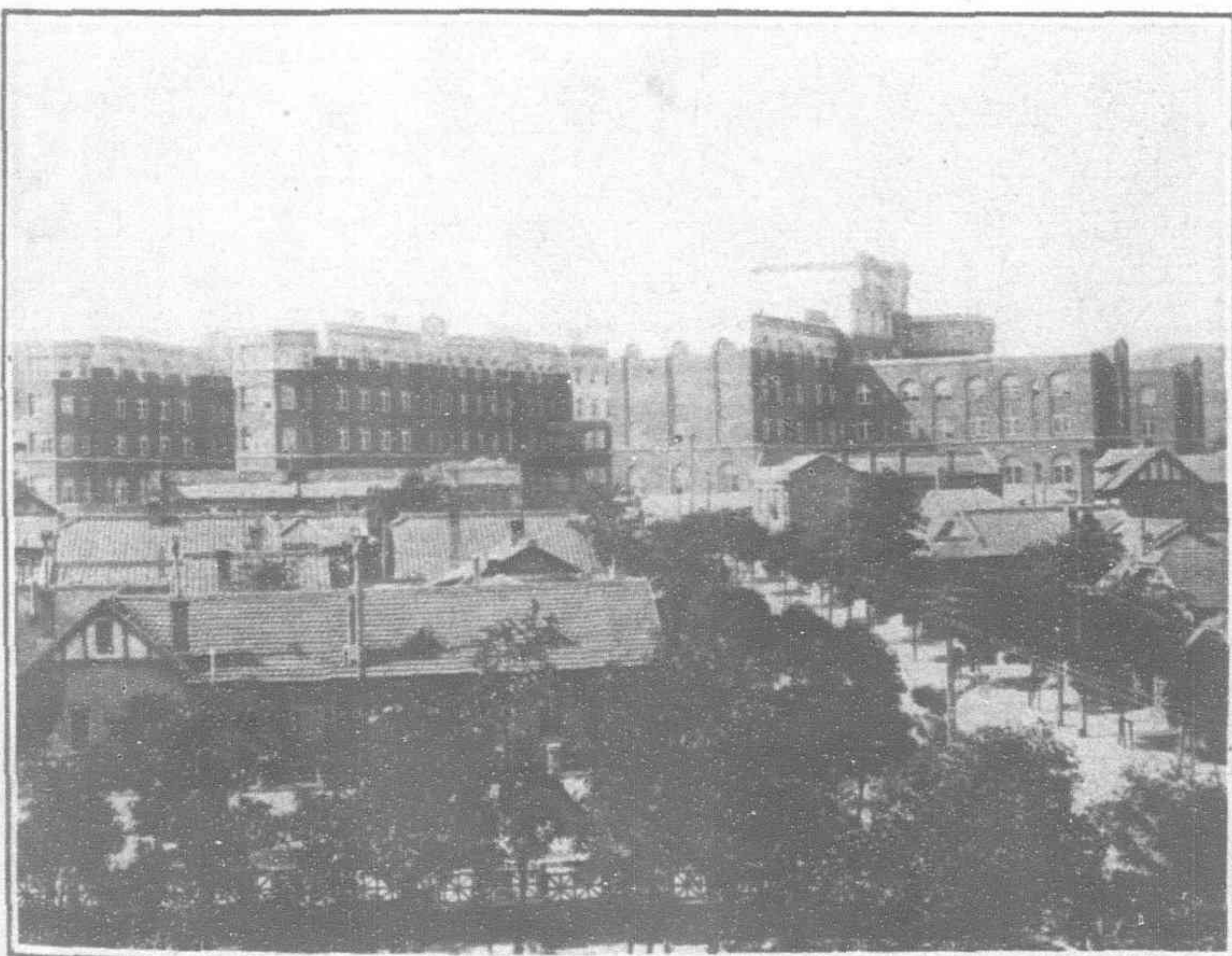
THE new Dairen Hospital, constructed by the South Manchuria Railway, to take the place of older buildings which had served a similar purpose, has now been open sufficiently long for it to be shown that it is meeting in a generous way the demands made upon it. Construction of the main building, which now houses what is considered to be the largest and best equipped institution of its kind in Manchuria, and one of the two largest on the continent of Asia, was started in 1923, but was not finished until two years ago. The structure, which has been planned on a Romanesque design, is of reinforced concrete with hollow tile facing. It was built by George A. Fuller and Company (of Japan), Ltd., and is a monument to American building ingenuity.

The central building cost approximately Y.6,000,000, but annexes and other auxiliaries have brought the total cost to about Y.8,000,000. The site, considered particularly suitable, required leveling. The heights on which the building stands are 70 feet above sea level, and command, in front, a view of Dairen Bay and, in the distance behind, Nanzan Hill.

The site is said to have been reserved at the time of Russian occupation of Dairen, or Dalny as it was then known, for an imperial villa for the Tsar. It is valuable now because of its being near to the chief government and railway administration offices, the Yamato Hotel and the downtown business section, while it is not far from the railway station and docks and shipping offices.

It is a long stride from the first medical establishment in Manchuria, a rude orphanage started at Tiehling in 1851 by a Catholic mission, to the elaborate equipment to be found here. A recent article in the "Manchuria Daily News" pointed out that, "The level of civilization of a country may be judged by what hygienic installations it has," and it is a policy developed from this feeling that has led the South Manchuria Railway administration to sponsor hospitals or hospital branches at several important places along its line, as at Mukden, Fushun, Wafangtien, Tashihchiao, Liaoyang, Kungchuling, Tiehling, Tsaohokou and Antung.

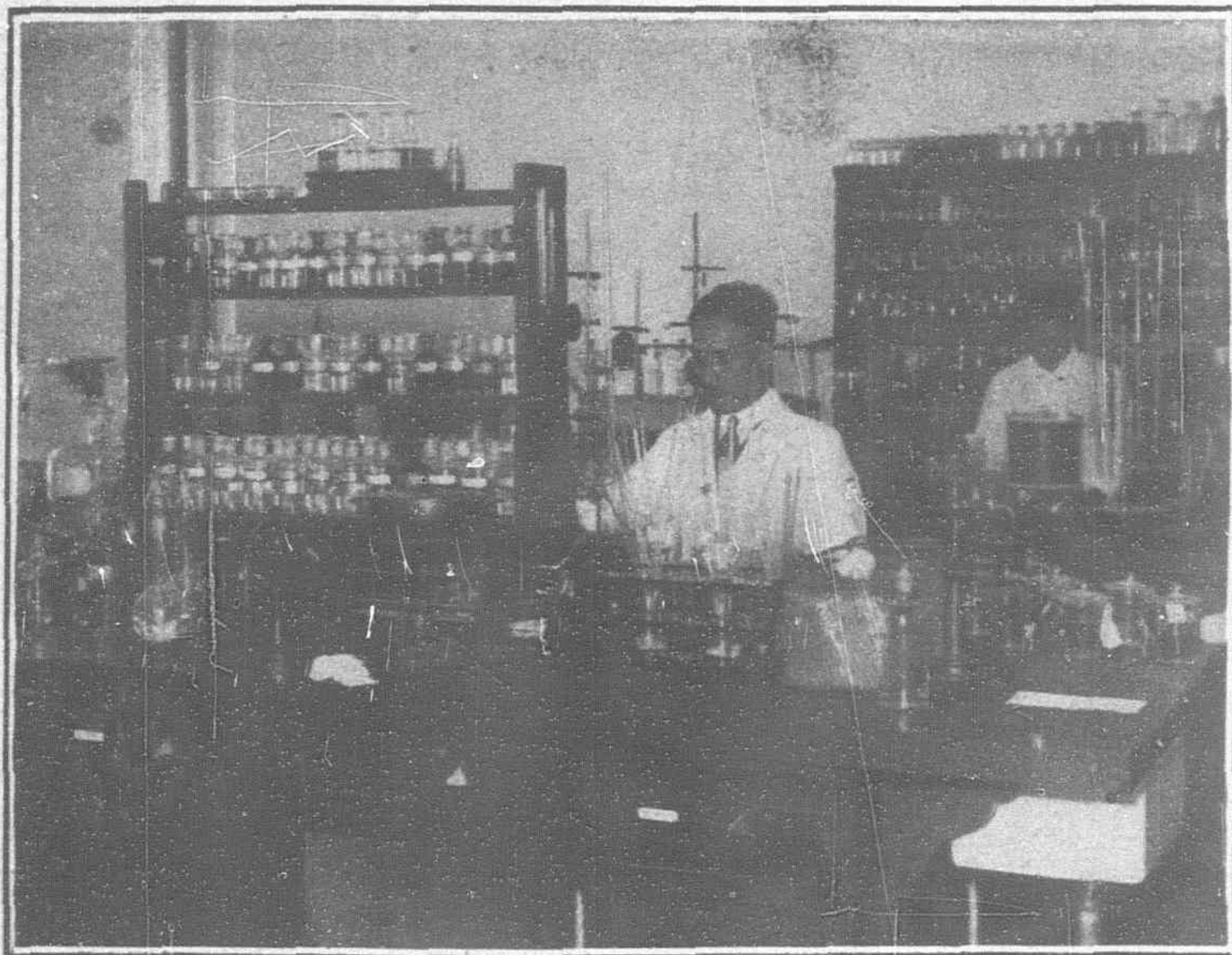
Japanese hospitalization in the Kwantung Leased Territory dates back to the Russo-Japanese War in 1904 when the Japanese wounded were sent south to Dairen from the front. The officers



The Massiveness of the Hospital Building



A Ward in the Hospital



The Laboratory



Construction Has Been Simplified to Permit Greater Expenditure on Equipment

were accommodated in buildings now used for residences, while enlisted men were placed in a group of buildings in an old hospital compound known as the Russian Railway Hospital. The present establishment is an outgrowth of the military organization.

Baron S. Goto, the first president of the South Manchuria Railway, is given much credit for originating a policy and establishing a program for development which includes humanitarian work of this nature.

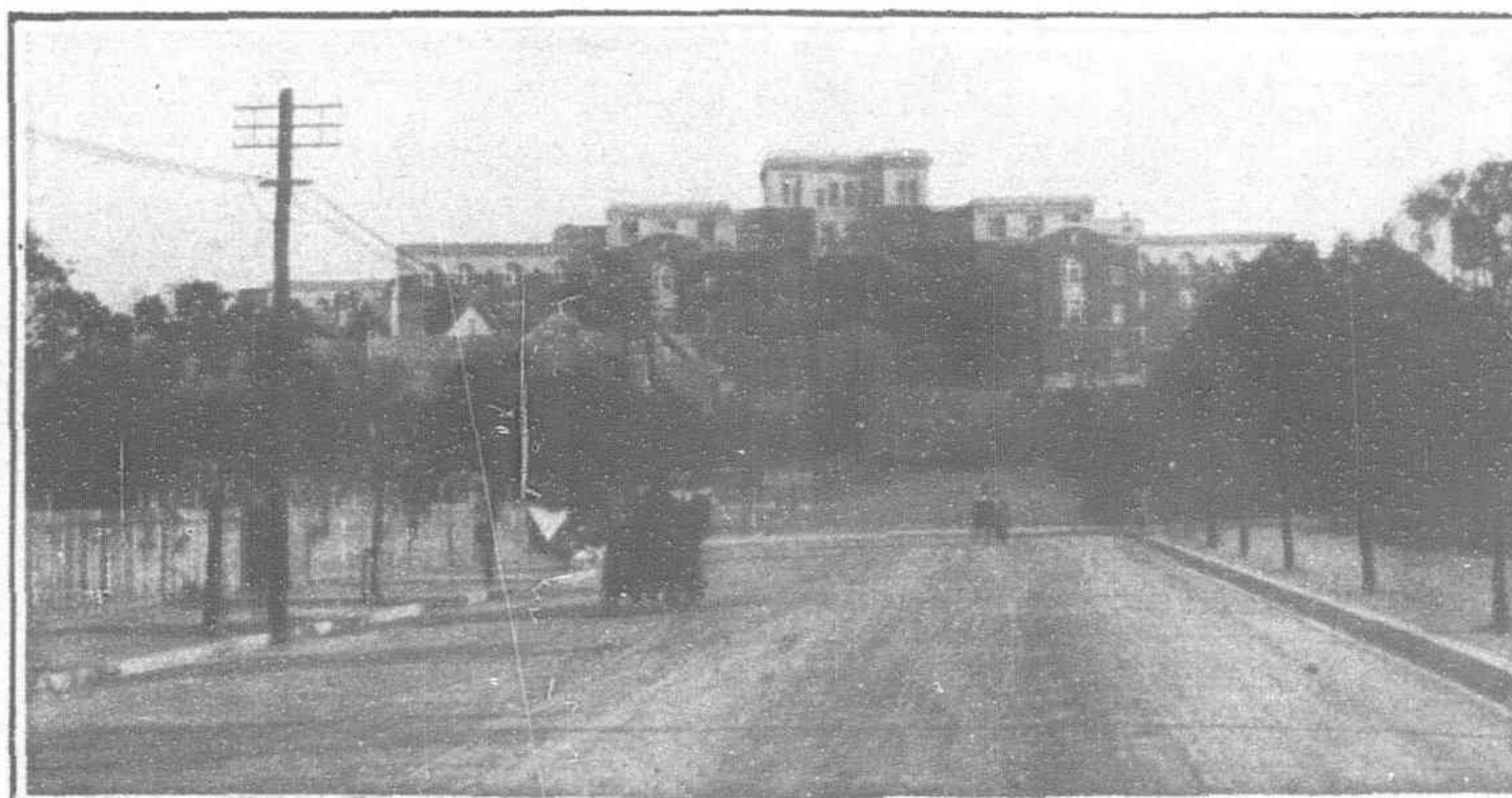
The building, which is erected on a foundation of clay slate of quartzite nature, has been reinforced to withstand both fire and earthquake shock. The earthquake which devastated Tokyo and Yokohama occurred while the reinforced concrete work was in progress, drawing attention to this feature and causing special care to be taken to ensure its stability. For reinforcing square corrugated bars were employed. Sand was brought from Shihho, south of Pulantien on the South Manchuria Railway's main line. Ballast was obtained chiefly from Choushuitzu. Concrete was

mixed for the most part at the ratio of one, two and three, although Onoda cement was employed in a richer mixture.

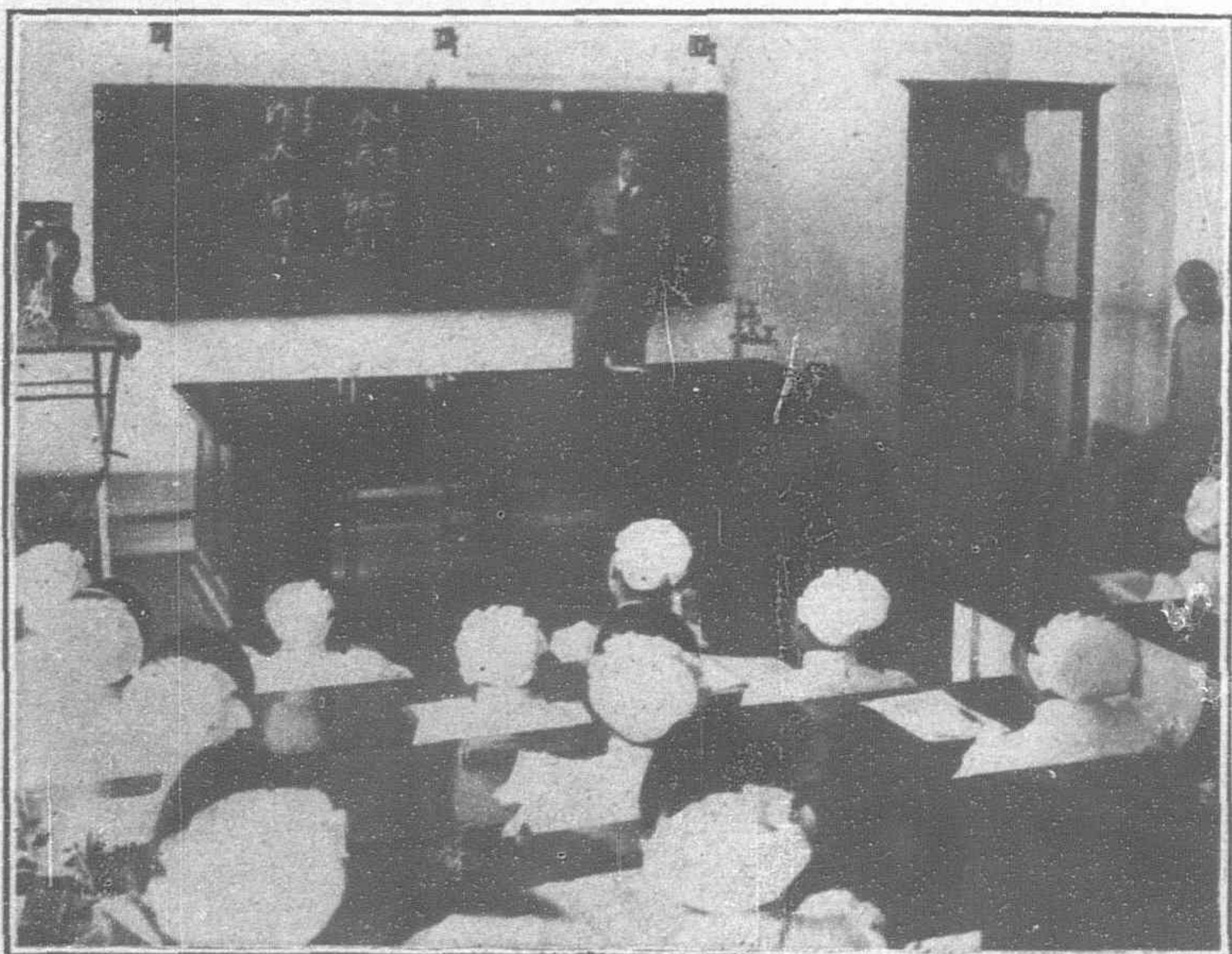
Space of about one metre has been left over the ceiling of each floor, and through this space the electric wires and gas, steam and water pipes run. The ceiling hangers, joists and laths are all of steel. As no wood has been used for partitioning or for construction underneath the floors, there is small possibility of fire. There is also no room for rodents under floors or in partitions.

All doors and window frames have been made of steel or iron. Notwithstanding these precautions, each floor is provided with fire hydrants. The doors themselves are either of steel or five-ply veneer, manufactured by the S. M. R. workshops at Shakako. The handles are for the most part American made.

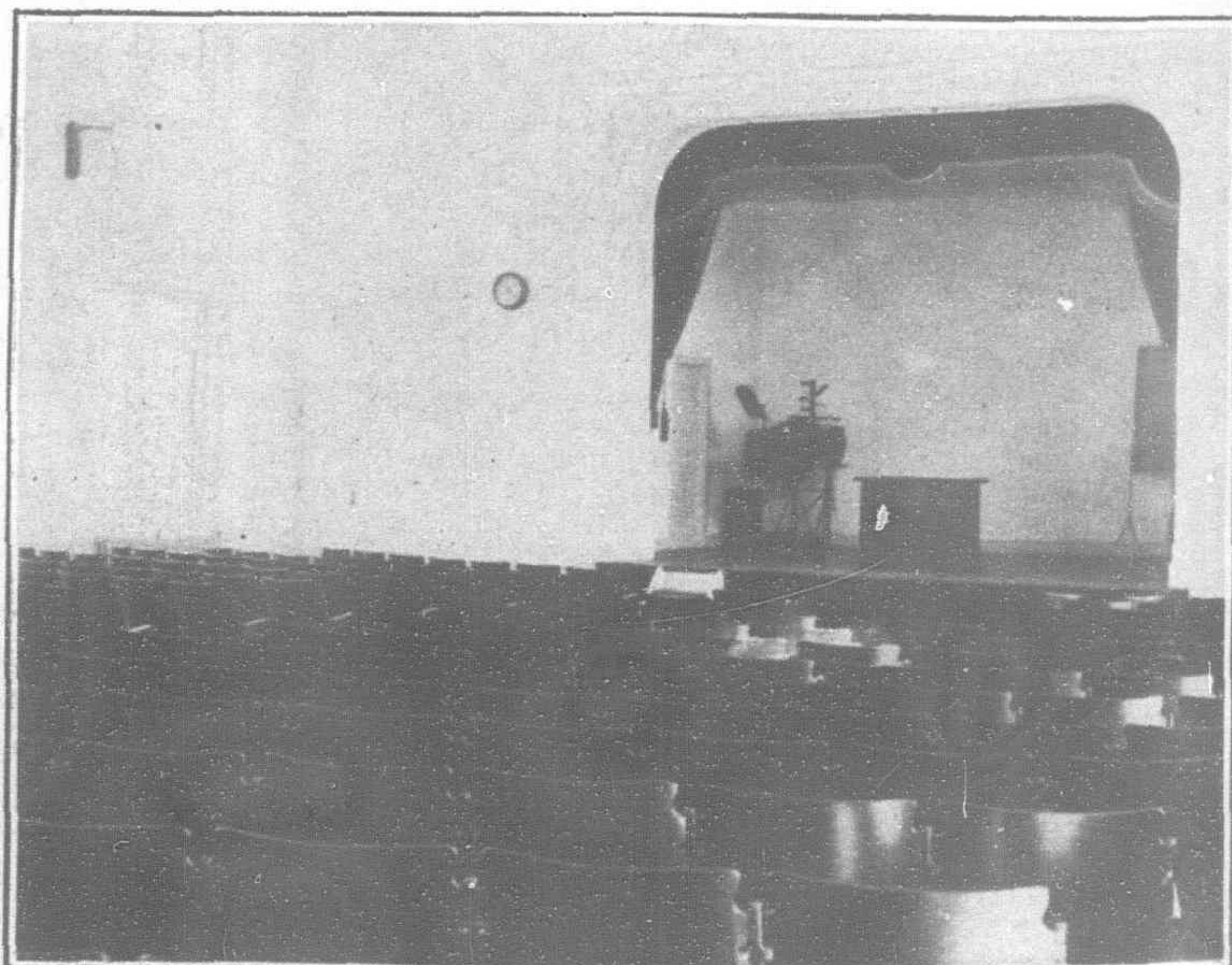
In erecting and fitting the building attention has been paid more to the value of equipment than to decorative design. The interior has been simplified. As a consequence of this policy,
(Continued on page 424)



A General View of the Hospital Building



Nurses, Pharmacists and Others Receive Training in Classes



A Large Auditorium is Part of the Hospital Equipment

Shipbuilding an Important Industry in Japan

THE building of ships of European style in this country began when the Government, awakened to the need of such ships by the visit of the American fleet at Uraga in 1853, lifted the ban on building large-size vessels, and built one for itself at Uraga.

In 1869 the Government promulgated a law on merchant vessels, advising the builders to adopt the European style for their ships; in 1875 the Government prohibited the building of Japanese style ships of more than 500 koku, and encouraged the building of those of better grade. But private shipbuilding concerns failed to appear as the Government might have expected; but some Americans and Germans built shipbuilding yards at Osaka and Kobe and engaged in building and repairing. This contributed much towards promoting the shipbuilding enterprise in this country.

As the maritime enterprise developed later, shipbuilding also began to be developed. In 1884 the Government leased the Nagasaki shipbuilding yards to the Mitsubishis and in 1886 the Kobe shipbuilding yards also to the Mitsubishis, and eventually sold them to the firm. But orders for large-size steel vessels or other ships of better class were placed with foreign shipbuilders.

Although the Sino-Japanese War caused an unprecedented activity in maritime enterprises, shipbuilding did not come up quite to the standard as was expected. Then the demand for protective and encouraging measures for shipbuilding became louder and in 1886 the Government promulgated a law for that purpose. The law provided that for each vessel built according to specifications, a subsidy of from Y.11 to Y.22 per ton would be granted, even so the builders still suffered from the effects of foreign competition. In 1899 the law was revised, and the subsidy for ships bought from abroad was reduced by half.

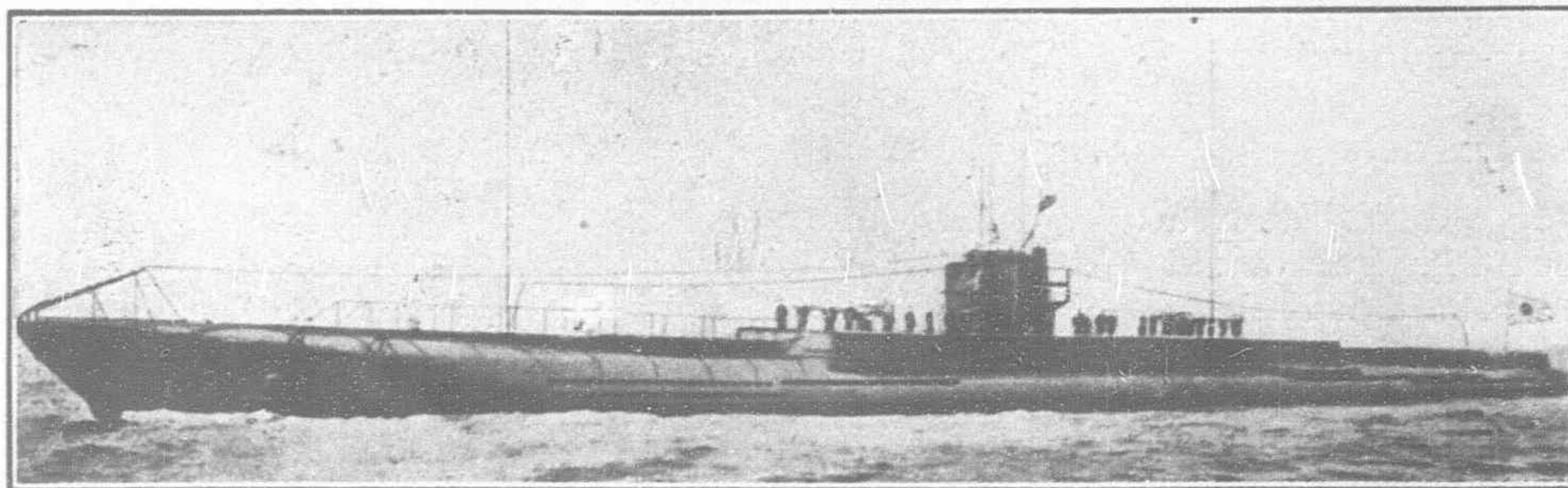
When the Russo-Japanese War broke out, the majority of large-size ships were commandeered for war service, and a large number of foreign ships were bought. All shipyards were then busily engaged in repairing these newly bought foreign vessels, and the number of ships built during the war decreased below that built in pre-war time, 1903.

However, the sudden increase in demand for ships by the war encouraged all shipyards to extend the scale of their plants and the total of new bottoms built in 1907, at the time of the post-war financial boom, reached the unprecedented figures of 72,700 tons.

The total of ships built in pre- and post-war days is as follows: (Unit ton).

1903	..	37,314
1904	..	23,264
1905	..	33,039
1906	..	32,300
1907	..	28,338
1908	..	72,757

On account of the reaction in maritime circles later, the total tonnage of new ships



Japanese Minelaying Submarine

showed a sudden decline, amounting to only 28,000 tons in 1910.

Contrary to this the total tonnage of sailing vessels that was 11,000 tons in 1910, rose to 33,000 tons in 1913, just preceding the great war, claiming nearly an equal basis with the steamships.

The tonnage of steamers and sailing

vessels built before the great war is as follows: (Unit ton).

Steamers				Sailing ships			
		Number of ships	Tonnage		Number of ships	Tonnage	
1910	..	77	24,479	147	11,097		
1911	..	142	41,229	216	13,182		
1912	..	168	48,155	372	23,899		
1913	..	115	51,525	659	43,598		

The outbreak of the great war caused the price of ships to rise sky-high, and also caused a record-breaking activity in shipbuilding circles. Prior to the great war there were only six shipyards with 17 slips that were able to build ships of more than 1,000 tons; in 1918 the year the armistice was declared, the number increased to 57 shipyards with 157 slips, and the total tonnage of ships built correspondingly increased, bringing in an enormous profit.

The total tonnage since the great war is as follows: (Unit ton).

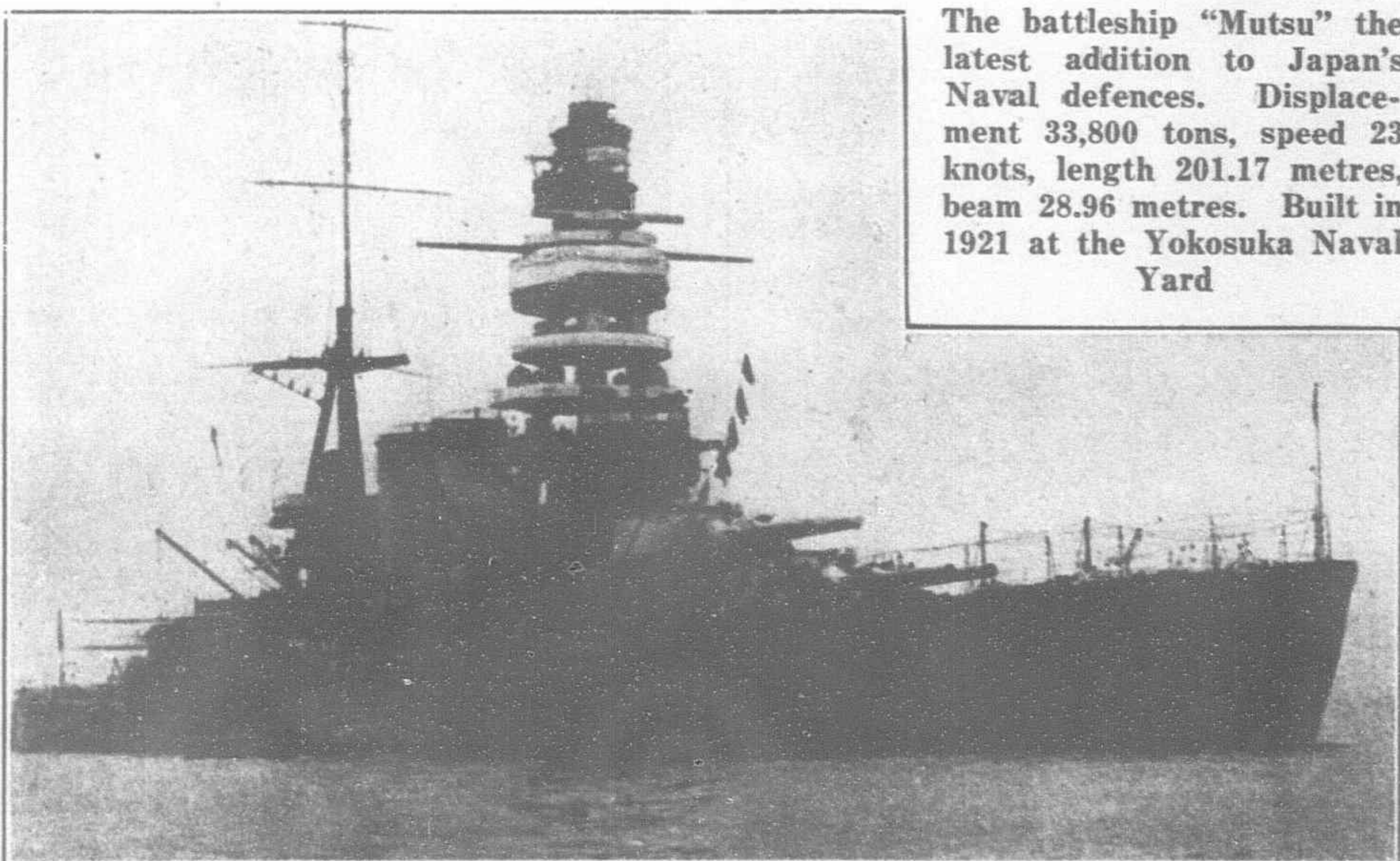
Steamers				Sailing ships			
		Number of ships	Total tonnage		Number of ships	Total tonnage	
1915	..	31	50,104	102	13,564		
1916	..	68	157,196	64	8,900		
1917	..	196	403,016	190	28,669		
1918	..	396	641,056	526	83,092		
1919	..	190	646,344	470	80,409		
1920	..	146	452,688	166	28,135		
1921	..	65	226,081	52	7,420		
1922	..	57	71,076	12	1,711		
1923	..	55	76,600	14	2,167		
1924	..	39	71,440	6	1,006		
1925	..	33	55,086	6	922		

When the general depression swept over Japan after the great

war, and the marine enterprises suffered from the blow the same as other industrial activities, the orders for new ships suddenly decreased.

Many shipyards closed or declared "holidays," and the equipment that was extended during the great war was gradually reduced to a smaller scale. In 1926 there were 91 principal shipyards with 32 factories where ships of more than 1,000 tons could be built, with 81 slips and about 38,000 workmen.

Granting the building capacity of



The battleship "Mutsu" the latest addition to Japan's Naval defences. Displacement 33,800 tons, speed 23 knots, length 201.17 metres, beam 28.96 metres. Built in 1921 at the Yokosuka Naval Yard

one slip to be about 8,000 tons a year, there should have been 648,000 tons for 81 slips. But the total tonnage built during 1925 was only 55,000, and this means that the majority of slips were lying idle. Some of the shipyards were engaged in turning out machinery or in repairing ships. The principal shipyards to-day are the Mitsubishi, the Kawasaki, the Osaka Iron Works, the Yokohama Dockyards, the Uraga Dockyards and the Ishikawajima Shipyards.

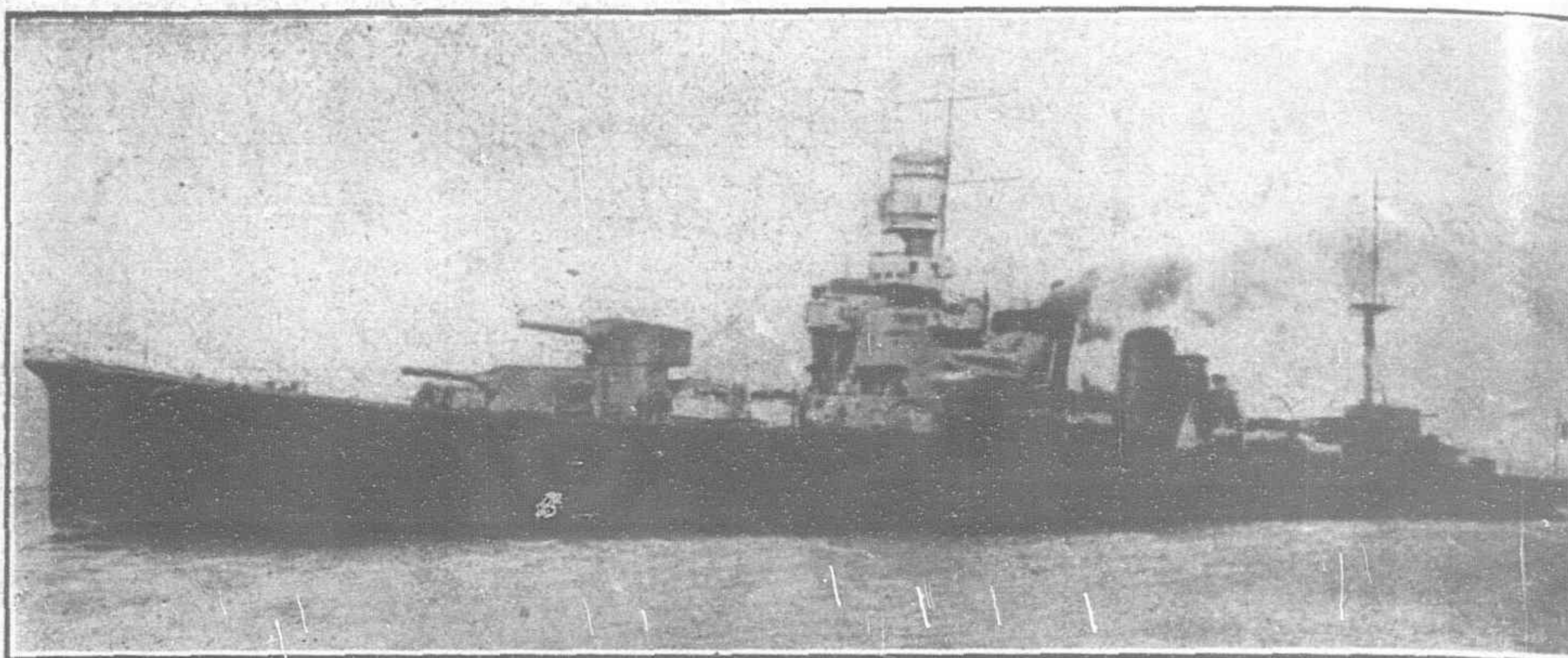
Kawasaki Dockyards

When the 15th Bank (Jugo Ginko) stopped payment during the panic of 1927, the Kawasaki Dockyards in Kobe which had been financially linked up with the bank, suffered in consequence and was forced to carry out a thorough-going readjustment.

The Kawasaki Dockyards, besides building warships, was engaged in building different kinds of ships, the wheels of locomotives, freight cars, passenger coaches, materials for motorcars, bridges, watermains and airplanes. Since the depression in marine circles and consequent decline in orders for new ships, it had planned the self-supplying of thin steel sheets for 200,000 tons a year and had completed equipment for producing 100,000 tons. It had started also building materials for electric cars, locomotives, bridges and sky-scrapers and had realized some profit.

The business showing of the Kawasaki Dockyards during the war boom and post-war days is as follows: (Unit Y.1,000). (All second half unless otherwise specified).

		Authorized capital	Paid up capital	Profit	Dividend (Unit per cent)
1917 ..	..	20,000	17,500	19,051	40
1918 ..	..	20,000	20,000	15,338	40
1919 ..	..	45,000	26,500	12,185	40
1920 ..	..	45,000	32,500	7,719	40
1921 ..	..	90,000	56,250	3,919	18
1922 ..	..	90,000	56,250	4,632	15
1923 ..	..	90,000	56,250	4,295	10
1924 ..	..	90,000	56,250	2,949	10



The Japanese Cruiser "Furutaka"

1925 ..	..	90,000	63,000	2,869	10
1926 { 1st half		90,000	63,000	3,282	10
2nd ,,		90,000	69,750	3,562	10

The Kawasaki Dockyards made a great profit during the war and even after the war, it continued to increase its capital and spent much in enlarging on a general scale, also as a means of tiding over the dull marine season, tried many different enterprises.

This necessarily called for a steady increase of capital, in addition to an enormous amount of public loans the interest of which alone totalled up to a large sum. The Kawasaki Dockyards as a result was in acute need of funds when the 15th Bank closed. A great readjustment of business affairs necessarily followed. The dockyards owe as follows: (Unit Y.1,000).

Debentures ..	..	..	..	..	58,000
Loans ..	..	..	..	..	3,650
Bills payable ..	..	..	..	..	67,137
					128,787

The Government was inclined to help the dockyards with a relief fund of Y.30,000,000, but dropped the plan when public opposition became serious. The dockyards is believed to be negotiating with the Industrial Bank of Japan and others for the supply of readjustment funds.

The New Dairen Hospital

(Continued from page 422).

59 per cent. of the total cost has gone into equipment. The following is a summarized outline of the extent of the hospital, including not only the new central building but of an isolation annex, nurses' quarters and auxiliaries.

Main building: four stories and a basement, with two additional stories over the center. The total floor space is 30,348 square metres.

Annex: (isolation ward), three stories with a basement, and an additional storey over part of the building. Floor space, 5,522 square metres.

Nurses' Quarters and Sick Room: two three-stories wards. Total space, 5,155 square metres.

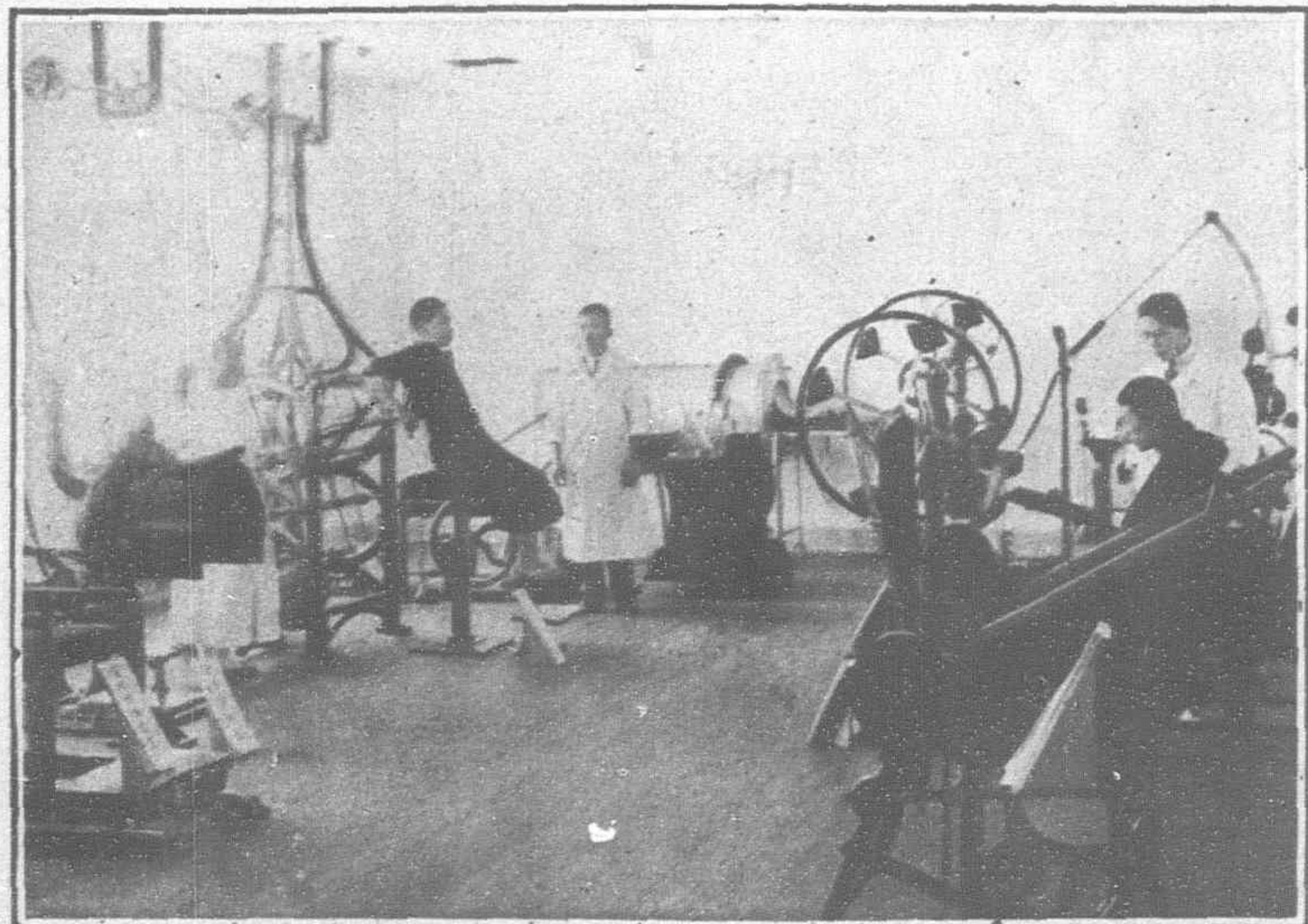
Auxiliary Buildings: Kitchen, engine room, power house, and mortuary. Total floor area, 4,155 square metres.

Tunnels: Connecting all of the buildings. Total area about 491 square metres.

Height of the main building: From the basement floor to the tip of a lightning rod, 120 feet.

The total of floor area is therefore 45,671 square metres.

The full ground area is 89,823,658 square metres.



Exercise is Made Easier by Mechanical Camels and Other Devices



Sun Rooms Are Provided on the Roof

Gas Companies in Japan*

THE gas manufacturing business in Japan has registered a remarkable development during the past 55 years. This industry was first started in Yokohama in 1872.

The Tokyo Municipal Office, in view of the successful business results of the gas manufacturing company in Yokohama, organized the Gas Bureau in 1874 and then transferred its business, in October, 1885, to the Tokyo Gas Manufacturing Company, which was established with a capital of Y.270,000.

It is noticeable that, while the Tokyo Municipal Office transferred the business of its Gas Bureau to a private concern, the Yokohama Town Office took over the management of the private gas manufacturing business in 1875 and then, with the elevation of the status of that town to city, the Yokohama Municipal Office undertook the management of the manufacture of gas and its supply to the citizens, having made the gas business one of the public works and therefore to be managed by the Municipality.

The gas business was not popular at first in other cities. For instance, Osaka had a gas manufacturing company established with a capital of Y.350,000 in 1896, immediately after the Sino-Japanese War. The capital consisted principally of foreign investments from the United States. In 1898, the Kobe Gas Manufacturing Company was established. Other cities followed in developing gas plants but this was almost 30 years after the industry was first started in Yokohama.

Encouraged by the general business boom after the Russo-Japanese War, the gas business became more active for some time and another private concern, the Chiyoda Gas Manufacturing Company, was established in Tokyo. This new concern was in keen competition with the Tokyo Gas Manufacturing Company for some time because of the reduction of its charges, but in 1912 the amalgamation of the two concerns was effected in order to avoid further competition.

The first half of 1914, right before the outbreak of the Great War, proved to be the most active time in the gas business, as the total paid-up capital stood at Y.68,520,000 at the end of March, 1914, the annual supply capacity then being as big as 5,037,255,000 cubic feet.

The outbreak of the Great War, however, proved a fatal blow to the gas manufacturing companies in direct contrast to the prosperity enjoyed by almost all other business concerns. Notwithstanding the fact that the price of coal showed an abrupt rise and that all other charges subsequently advanced after the outbreak of the Great War, the gas manufacturing companies were not permitted to raise their prices. Hence some concerns were obliged either to close down or to be amalgamated with other companies in order to exist.

This caused the total number of the gas companies in Japan to decrease to 87 in 1917 and to 72 in 1918, while these concerns numbered 91 at the end of March, 1916, that is to say, total decrease of 91 was witnessed during the two years.

The particulars of the gas business during the six years after the outbreak of the Great War are shown in the following table:

Years (End of March)	Light (Unit 1,000 lots)	Heating (Unit 1,000 lots)	Power (Unit horse power)
1914 ...	1,833	768	15,440
1915 ...	1,542	906	15,382
1916 ...	1,474	1,018	15,886
1917 ...	1,542	971	16,135
1918 ...	1,556	938	13,945
1919 ...	1,329	1,035	17,413

The use of gas for light and power, with the exception of that used for gas heating, has steadily decreased as evidenced in the foregoing table. This fact is attributed to the recent activity of the electric business, which has almost replaced gas so far as light and power are concerned.

After the Great War the price of coal somewhat dropped. In addition, gas charges were raised, slightly. These two factors have made the management of the gas business easier than before.

The price of iron piping also slumped after the Great War. This has enabled the gas companies to use these iron pipes for the supply of gas, whereas before they were forced to use lead pipes on account of the high price of iron.

Although the gas light and power business is still affected by the electric business, the use of gas for heating has steadily increased and the business has now somewhat recovered its former activity.

This is evidenced by the facts that some concerns have increased their capital for the purpose of extending their business and that the establishment of a new gas company in Tokyo is now being planned for the purpose of supplying the suburbs with gas.

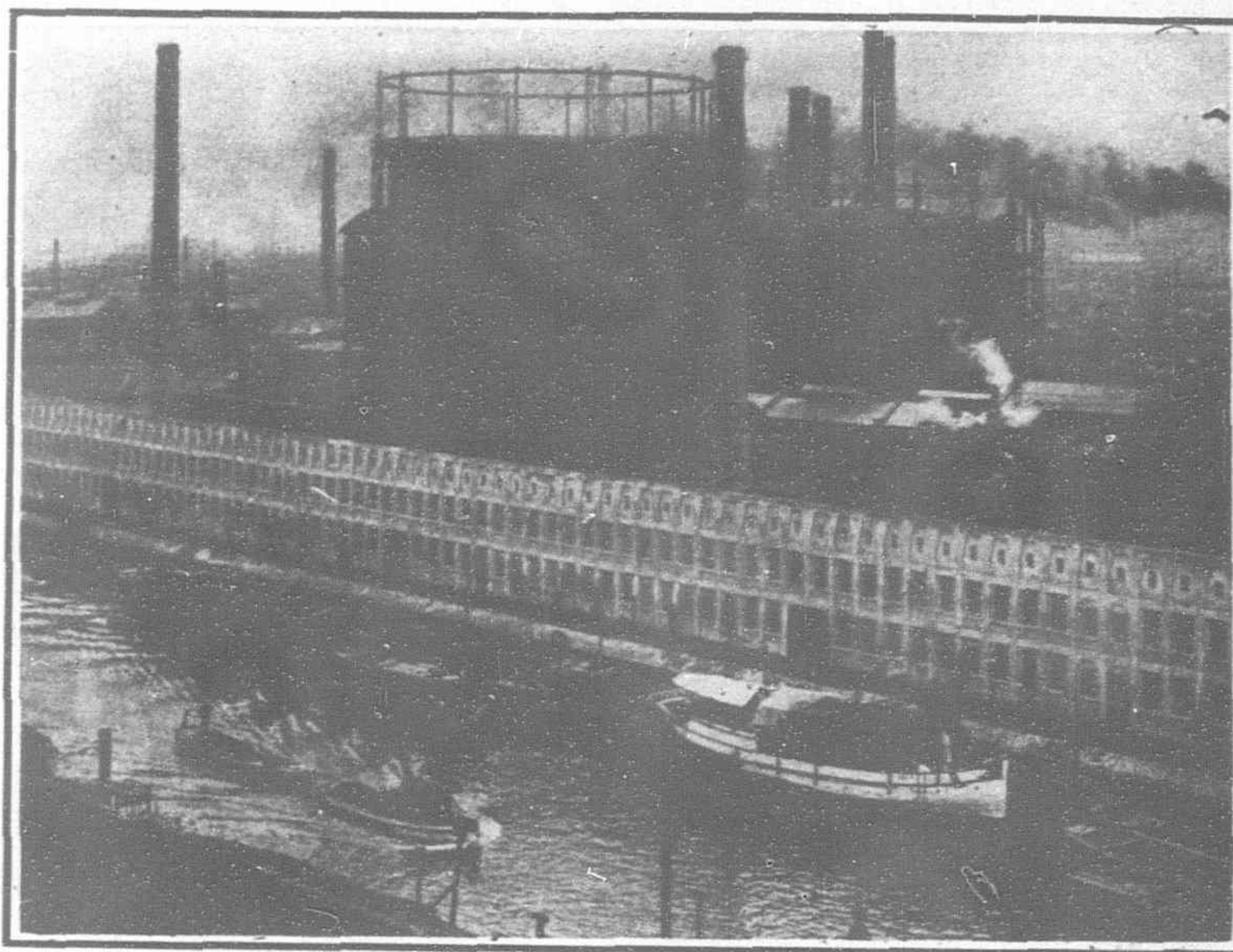
The recent business results of the gas companies in Tokyo, Osaka, Kyoto, and Kobe Cities are shown in the following table:

TOKYO GAS				
Business term		Paid-up capital (Unit Y.1,000)	Profit	Dividend (Per-centage)
1926 1st half ...	...	45,000	3,079	9
1926 2nd half ...	...	49,583	3,413	9
1927 1st half ...	...	58,750	4,378	9
OSAKA GAS				
1926 1st half ...	...	15,643	1,406	11
1926 2nd half ...	...	17,000	1,609	12
1927 1st half ...	...	17,000	1,673	12
KYOTO GAS				
1926 1st half ...	...	5,000	844	14
1926 2nd half ...	...	5,600	739	14
1927 1st half ...	...	5,600	858	14
KOBE GAS				
1926 1st half ...	...	8,687	1,005	12
1926 2nd half ...	...	8,687	1,022	12
1927 1st half ...	...	8,687	1,035	12

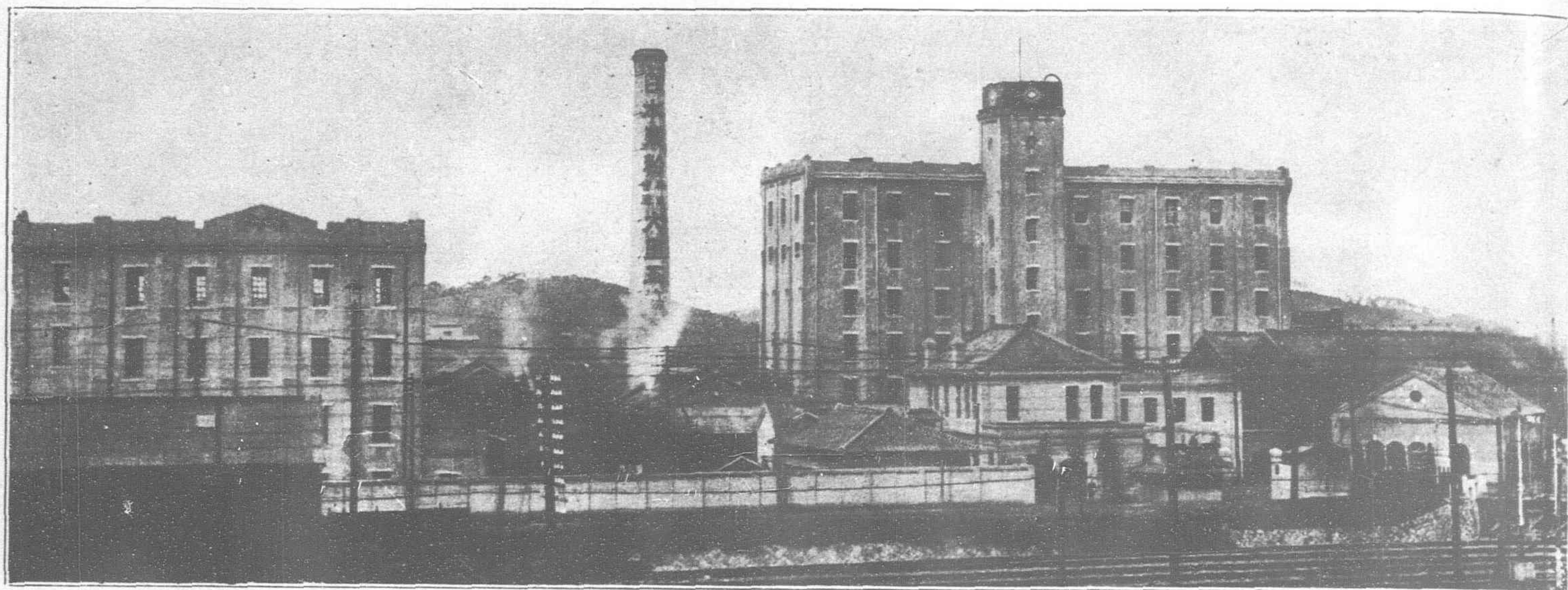
In view of the steady increase in profit, the Tokyo Gas Company, in January, 1926, increased its authorized capital to Y.100,000,000 and extended its business, bettering the equipments of the old factories. The company not only has successfully coped with the increased demand for gas in the city, but has also prepared for the demand from the suburbs, lowering its charges for the suburbs, while the charges were somewhat higher than for the city, and establishing a new factory in the suburbs of Tokyo. The company has thus prevented the organizing of another gas company, because the recent increased demand for gas for heating purposes in the suburbs of Tokyo is really worthy the establishing of a new gas company.

(Continued on page 427).

* "The Osaka Mainichi."



The Osaka Gas-Works Near the Kizukawa, Osaka



Dairi Mill of the Nihon Flour Company. Capacity, 1,500 Barrels per Day

Flour Milling in Japan*

Steady Development of New Industry Promises Much for Future

THE flour manufacturing in this country, up to the beginning of the Russo-Japanese War, in 1904, was still in the water-mill stage. It was principally manufactured by water-mills scattered everywhere, each with a capacity for only 10 to 50 sacks a day and of inferior quality at that. The major portion of what was wanted was imported from abroad. Nihon Seifun Kaisha (the Japan Flour Manufacturing Co.) which was established in 1896 was the only flour mill that was run on a modern system, although its productive capacity was only 200 barrels a day.

As a result, however, of the Russo-Japanese War which demanded a large quantity of flour for military provision, milling of flour rapidly appeared in an up-to-date system. After the war, along with other industrial enterprises that had risen, the flour milling became very active. Whereas the productive capacity was limited to only 750 barrels a day in pre-war days, it increased in post-war days, in 1910, to 8,700 barrels a day as follows:

		Daily capacity		Annual capacity
		Barrels	Sacks	Sacks
1903	.. ..	750 or	3,375	1,012,500
1910	.. ..	8,700 or	39,150	11,745,000

Flour milling by machinery steadily encroached upon the field of the water-milling until it showed the following figures in 1910. (Unit 1,000 sacks).

Water mills	.. ..	7,500 sacks
Machinery mills	.. ..	7,236 "
Imported..	.. ..	798 "
		15,534 sacks

After the Russo-Japanese War, industrial circles suffered a reactionary depression, and many flour mills either closed or amalgamated with others. The mushroom flour mills that sprang overnight during the war were finally thus swallowed up by three leading mills—The Nihon, Nisshin and Toa in Tokyo.

These three flour mills, however, experienced financial difficulty on account of the prevailing depression, and in October, 1910, agreed on restricting their output to one-half of normal productive capacity and also on observing uniform prices. This agreement achieved no satisfactory result.

In 1914, when the great war broke out that called for an enormous quantity of flour, the milling market revived its activity. Consequent upon the great war, the production that was 9,060 barrels in 1913 increased to 21,600 barrels in 1921.

Material Imported

Because of this increasing production of flour, the domestic wheat was found insufficient for supplying the mills with the needed material. Imports of foreign wheat subsequently increased, causing a gradual change of basing the quality of flour on the domestic wheat to that on foreign wheat. This also necessitated the establishment of flour mills in Yokohama or Kobe where they would be more convenient to transport foreign wheat from ships to the mills, whereas, before, the mills were established in the wheat producing centers in the interior.

The extension of mill works and consequent increase of output caused inevitable overproduction and the fall in price to such an extent that all flour mills became alarmed. They then agreed on restricting the output and observing a uniform price in order to maintain the price at a certain level.

Some of the mills were so hard pressed that three mills were amalgamated by the Nihon Flour Manufacturing Company while two mills were amalgamated by the Nisshin Flour Manufacturing Company in 1920.

The Nihon in 1925 amalgamated the Toa and virtually divided the field between itself and the Nisshin. In 1926, when the Nihon tried to absorb the Nisshin also, a large financial loss on the part of the Nihon was discovered and the negotiations were called off. The loss became definite when it announced, prior to the second half of 1926, that it was short Y.12,650,000.

In order to even up this loss, the Nihon transferred part of the reserve funds to the loss and reduced its capital of Y.12,300,000 to one-fourth of Y.3,075,000 and adding Y.8,000,000 (debt to the Suzuki Shoten of Kobe) as new capital, began its activity. But then early in 1927 the Suzuki exposed its financial weakness when the panic swept over the country, as the Nihon again found itself in acute distress. It even felt difficulty in purchasing raw material. It is planning to make a fresh start again with the backing of the Mitsui Bussan Kaisha.

The Nisshin, on the contrary, has been realizing a profitable business, keeping up the dividend of 15 per cent. per annum. The recent business condition of the Nisshin is as follows: (Unit Y.1,000).

		Authorized Paid up		Profit	Dividend
		capital	capital		
1925 1st half	.. ..	Y.12,330	Y.6,840	Y.1,268	20%
2nd half	.. ..	12,330	6,840	1,078	20%
1927 1st half	.. ..	12,330	6,840	912	18%
2nd half	.. ..	12,330	6,840	742	16%
1927 1st half	.. ..	12,330	7,938	844	16%

*From "Japan To-day and To-morrow."

The daily capacity of output of both the Nisshin and Nihon of recent date is as follows: (Unit barrel).

Nisshin	Mills	Nihon
2,000	Kobe	1,800
900	Yokohama	4,500
1,000	Takasaki	900
2,500	Tsurumi	—
2,100	Nagoya	—
1,600	Torisu	—
1,100	Okayama	—
1,000	Tatebayashi	—
1,000	Mito	—
850	Sakade	—
700	Utsunomiya	—
600	Sano	—
—	Tokyo	5,000
—	Moji	2,800
—	Kurume	1,200
—	Oyama	700
—	Otaru	700
—	Sapporo	400
—	Sendai	400
15,600		18,400

Gas Companies in Japan

(Continued from page 425.)

The Osaka Gas Company has lowered its supply charges twice since July, 1926. The company further has decided to extend its business on a large scale as it increased its capital to Y.34,000,000 in the second half of 1927.

The gas business thus is now on its way to the recovery of its past activity and large future development after a long spell of business depression. The general tendency in the gas business for recent years is shown in the following table :

Years	Number of companies	Paid-up capital (Unit Y.1,000)	Annual supply capacity (Unit 1,000 cubic feet)
1921	...	76	170,243
1922	...	75	276,373
1923	...	74	416,156
1924	...	76	507,202
1925	...	73	552,651
(5 under preparation)			512

It is rather remarkable that the gas business alone should tend to develop, while other business activities are all hard hit by the recent financial difficulties and the consequent business depression. This is evidenced in the recent increases in the capital of the gas companies and their supply capacity.

The Conqueror, a New Gasoline Shovel, is Announced

THE Conqueror, a new gasoline shovel of the full revolving type and fully convertible to dragline, back hoe, clamshell and crane service, has been placed on the market.

The Conqueror is mounted upon a new and improved Continuous Tread Truck Frame of the double chain drive type.

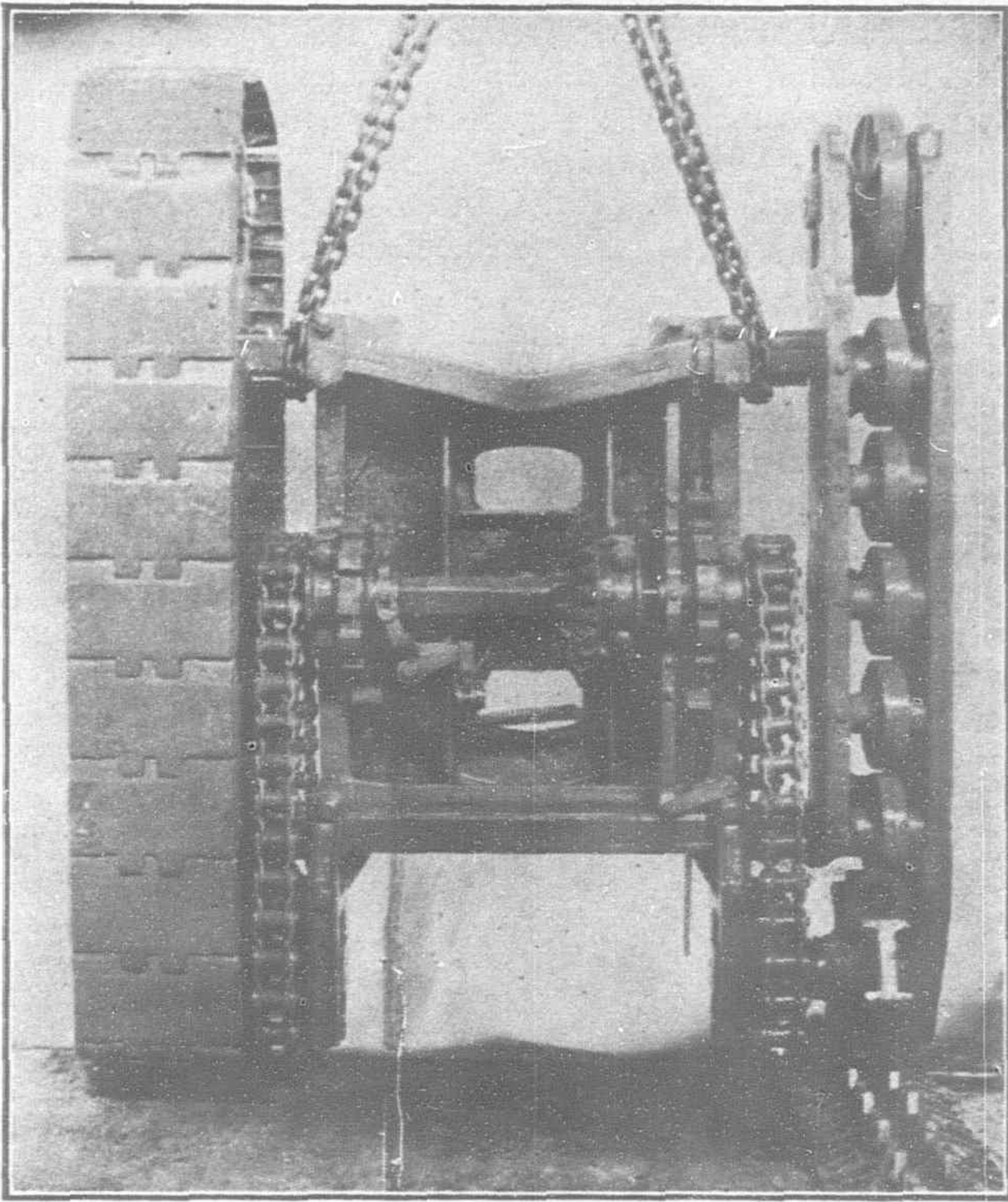
The machine, as a shovel, carries a minimum length boom of 20-ft. and a handle of 15-ft., with a back hitch type dipper, and for crane service carries a 45-ft. boom of the structural lattice bow type, with built in tagline and with a fairlead for dragline service self-adjusting to any angle of the boom.

The new Conqueror is characterized by simplicity and sturdiness in construction, ease of maintenance and ready accessibility to its mechanical parts.

In changing the Conqueror from shovel to clamshell, back hoe or dragline service, no additions or changes are necessary in the

operating machinery. The only changes required are those involved in changing the boom assemblies. This work may be done in the field in a few hours time.

The Conqueror has been produced by the Osgood Company, Marion, Ohio, manufacturers of excavating machinery of long standing.



An 80-h.p., 6 cylinder gasoline motor is mounted at the rear of the machine on the massive unit steel main body frame casting. Heavy unit steel side frames securely attached to the main body casting support the drum shaft and the reversing shaft. In this way, complete alignment of parts is constantly assured, and vibration is reduced to the minimum.

A special feature of this machine is the combination, cast iron gasoline tank and counterweight which is set into the deck at the rear of the motor. This arrangement saves space and extra counterweight and at the same time greatly reduces the fire hazard because of the thick heavy walls of the gas tank. The gas tank being located at deck level eliminates the necessity of gasoline pump or other accessories for filling the tank. The tank is large, having a capacity of approximately 75 gallons, which is usually enough for a two day supply.

The motor is equipped with a large 6-cell, 12 volt, 112 ampere hour storage battery, electric starter, voltage regulator, gasoline filter, Pomona air cleaner, and muffler, all of which tend to increase the efficiency of the Conqueror in operation. The voltage regulator is of a type similar to those used in governmental airplane service and automatically prevents the over-charging of the storage battery and maintains the charge at the proper point. The air cleaner used on the Conqueror is the best to be obtained upon the market to-day. It assures an ample supply of air to the carburetor free from dust and foreign particles which would impair the functioning of the motor.

The well known Osgood Servo Mechanism for setting the clutches on the hoisting and hold back drums, and the famous Osgood application of the wire rope crowd which has been used by Osgood for many years, are retained in the new Conqueror. The Servo Mechanism makes the motor do the work and relieves the operator of tiresome lever pulls. A touch of one finger is sufficient to make the control levers respond.

The Osgood application of the wire rope crowd is characterized by its extreme simplicity and high operating efficiency. It is self-adjusting to various boom angles. The essential parts, aside from the necessary wire ropes, consists only of the second or pull back drum on the main drum shaft and the shipper shaft drum. The hoisting rope is carried from the hoisting drum to the sheave at the boom point, thence to the dipper sheave block, and back again to a

second boom point sheave and from there down to the shipper shaft drum where it is wrapped and anchored. A second and independent wire rope is carried from the pull back drum on the main drum shaft to the shipper shaft drum where it, too, is wrapped and anchored. The ropes are wound on the shipper shaft drum in such direction that the pull on the hoisting rope will turn the whipper shaft and crowd the handle out. This motion may be prevented by setting the brake on the pull back drum or may be reversed by throwing in the pull back drum clutch friction. This type of crowd is very simple and easily controlled. It is automatic in action and has great crowding power, due to the multiplying action of the differential drum mounted on the shipper shaft. No slack ever occurs in the cables, consequently they need no attention.

The hoisting and crowding are perfectly timed and co-ordinated, making it easy to cut to any grade desired. The use of two drums make it unnecessary to add to the machinery when shovel is converted to clamshell or dragline.

The Conqueror is mounted upon a truck that is absolutely the last word and is the result of years of experience in designing truck frames. It is very heavy and rugged, exceedingly simple in construction, easy to control and maintain in operation. It has a travel speed of approximately seven-tenths miles per hour and will negotiate grade up to and in excess of thirty per cent. The Conqueror truck is designed to give the upper body a suitable mounting for travel over all kinds of material, ranging from rock to mud, and at the same time furnish sufficient locomotive power to enable it to move readily from one point to another.

The Continuous Tread Truck is of the double chain drive type and is built up entirely of steel castings, with axles and cross travel shaft of hammered steel. The truck frame is a single massive steel casting. The roller path gear is of cast steel with cut teeth of the outside type, and is securely riveted into place on the truck frame casting, and has a machined shoulder to more securely hold it in place. The side frames are large unit castings and are of box section, bow type construction. Five travel rollers 14-in. in diameter are mounted within each side frame. These rollers operate on stationary shafts and are lubricated by recessed high pressure gun fittings.

An idler tumbler 25-in. in diameter is mounted in one end of each side frame casting, while in the opposite end the driving tumbler is mounted. Both tumblers are on stationary shafts with screw adjustments in tension. This arrangement makes it possible to adjust the tension of the tread belt from one end and the tension of the driving chain from the other end. The tread links are of improved type, one piece and overlapping, and of very strong, heavily ribbed construction. These links are pin connected by large steel pins in quadruple shear and are unlubricated. They are of the "full floating" type so that wear is distributed evenly about the pin, and making it easy to remove the pin when desired.

Power is transmitted from the vertical travel shaft to a single, one piece cross propelling shaft held in three heavy bearings. The cross travel shaft is of 4½-in. squared section and no keys are used in its construction. There is mounted on this shaft one bevel gear, two jaw type clutches and two bronzed bushed driving sprockets. Power is transmitted from the driving sprocket to driven sprocket on the driving tumbler by means of very heavy roller chains. There is one very heavy roller chain on each side delivering power direct to the tread belt driving tumbler.

The truck is steered by means of bell crank and levers controlled from the cab at the operator's position, irrespective of the position of the upper body or of the truck frame and without making connections of any sort. Automatic locking pawls hold the machine in any digging position and can be so controlled that movements will be prevented in one direction and be perfectly free in the opposite direction. Direction of moving for digging operations can be controlled as desired. The truck is bronze bushed throughout and is also lubricated by high pressure gun fittings that are so located that it is not necessary to get under for greasing. Every fitting is located in an accessible place.

The driving clutches can be easily disengaged for towing purposes.

The Conqueror has ample deck space all around the machinery and the motor. The control levers are all banked to the left front side of the machine where the operator has a full view of his work at all times and has complete control of his machine without leaving his seat.

Motor controls, including oil pressure gauge, are banked on an instrument board within view and reach of the operator. The

house or cab is all of steel construction, fully enclosed, and is provided with large door openings, and a window in the rear for light and ventilation. Electric dome and flood lights provide illumination from the storage battery for night operation.

The Conqueror is painted a rich olive green color.

The Conqueror will be found an economical machine to use in various types of service, and with various attachments, from lightest to the heaviest kind of work. The Conqueror has the correct balance and proportion in design to give it the right amount of speed and power, combined with sufficient back-bone to enable it to function over long periods of time under rather adverse operating conditions.

It is a tested machine, and its operation, maintenance, and repair will be pleasing to any owner or operator.

Damage to the Tientsin-Pukow Railway

According to investigations made by the railway authorities, the material damage done to the Tientsin-Pukow Railway as a result of military operations during the Northern Expedition is estimated at \$18,621,663.00. Eighty-three locomotives, 315 passenger cars, and 1,058 trucks were either destroyed or seriously damaged.

A detailed account published by the Tientsin-Pukow Railway Administration gives the loss as follows:

	\$
Damage to rails	158,737.46
Damage to bridges and tunnels	151,539.42
Damage to railway stations	97,274.01
Damage to railway godowns	60,525.00
Damage to railway offices	6,000.00
Damage to employees' residences	37,023.22
Damage to locomotives	6,640,000.00
Damage to passenger cars	6,595,000.00
Damage to trucks	4,220,000.00
Damage to telegraph and telephone lines	25,933.00
Damage to water towers	285.00
Damage to steam launches and junks	75,000.00
Damage to wharves	20,138.00
Damage to railway material	300,660.00
Miscellaneous damage	69,902.00

Of all the Government railways affected by the late civil war, the loss suffered by the Tientsin-Pukow Railway is the greatest because of the heavy and prolonged fighting between the Nationalist and Sun Chuan-fang's troops within the area served by this Railway.

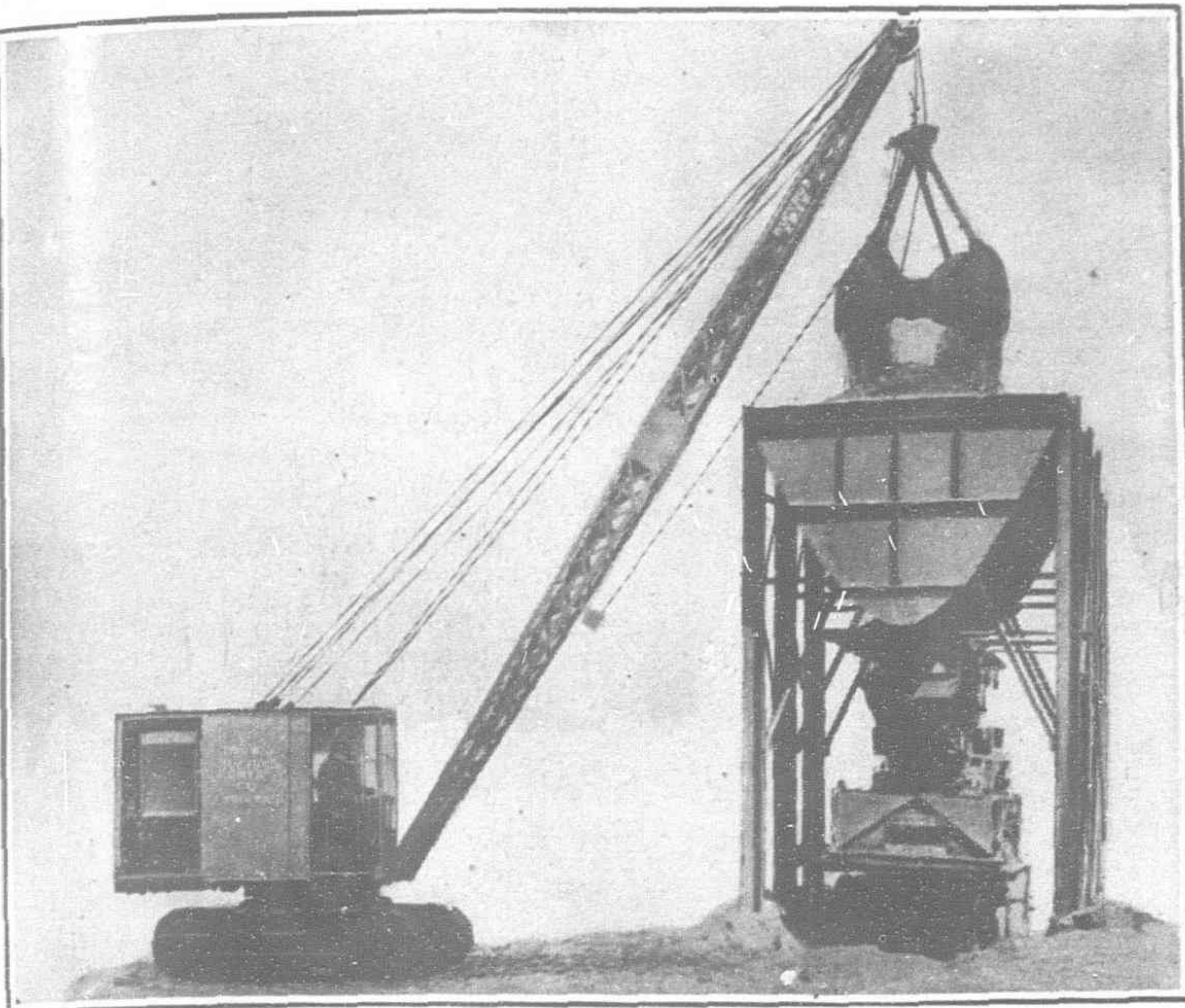
—Kuo Min News Agency.

Book Notes

"The Elesco Superheater for Power Plants" is written in the light of engineering efforts toward increasing fuel economy in America and abroad. Every phase of superheat is discussed; also the requirements for proper superheater design and how they are carried out in the Elesco design. Practically every make and type of boiler with an Elesco superheater is illustrated and explained.

In the first part are the introductory remarks giving brief statements about the Superheated Company and its activities in the power-plant field. The part played by superheated steam, basic definitions, and briefly the advantages gained through the use of superheated steam, are also given. The next section, "Application of the Elesco Superheater," gives general descriptions or specifications for the 67 superheater and boiler arrangements illustrated.

Convenient guides to the text and superheater and boiler illustrations are given in the front of the book. An industrial superheater information sheet will be found at the back.



The Large Motor Gives Ample Power—and the Big Swing Clutches Permit Fast Operation as Shovel, Crane, or Dragline Excavator. This Machine Also has High Hoist Speed.

New Bucyrus-Erie Shovel

NEW possibilities for the $\frac{3}{4}$ -yard petrol Shovel, Dragline and of Crane have been brought out by the remarkable performance the Bucyrus-Erie Type "1030" machines, which have just been put into quantity production.

The outstanding feature shown by the machines now in service is the great power and speed, combined with great strength.

A 72½ horse-power petrol engine gives the "1030" about 30 per cent. more power than provided on even the most powerful of previously built petrol cranes and excavators of this size.

As compared with the average crane and shovel of the same dipper capacity, the "1030" has approximately 40 per cent. more power—with a corresponding advantage for hard digging, or for making high speed on material handling.

For example the hoisting line speed is faster at every load, and the swing is 6½ per cent. to 13 per cent. faster than the speediest of previously built petrol cranes, draglines and shovels of this size. The swing speed is from 4, to 5 complete revolutions per minute.

The more powerful motor permits the use of larger hoist drums, higher line speeds for faster closing and hoisting of a $\frac{3}{4}$ -yard clam-shell bucket and faster overhauling of a $\frac{3}{4}$ -yard dragline bucket. To take care of the greater speed, large contracting-band clutches are used with a large brake, of the contracting shoe type, to stop the swing. This allows the operator to swing the machine faster without any fear of over-heating and rapid wear on the clutch bands, since the stopping of the swing is done with the brake. Besides permitting exceedingly fast operation, this separate brake adds extra life to the swing clutch.

Large clutches are used—oversize even for the high operating speed, assuring long wear and freedom from trouble. And they are outside band clutches, simple and easily accessible.

To prevent any chance whatever of the swing gears working apart and springing the shafts, these gears are mounted in and positively aligned by a steel box housing. This insures perfect meshing, permanently—These gears are completely enclosed and run in oil.

The construction of the Bucyrus-Erie "1030" is very simple and rugged, with extra strength built into all parts where extra strength counts most.

An example of the unusually rugged construction of this machine is to be found in the drum shaft, which is of large diameter. The swing clutch shaft likewise of large diameter and all other parts are in proportion.

Every good feature which has proved its value in adding to the reliability of Bucyrus-Erie machines is to be found on the "1030." The truck frame is a one-piece steel casting, practically indestructible. The revolving turntable is of the same one-piece cast steel construction, providing a rigid base for the operating machinery—cutting down vibration to the minimum, and keeping the machinery in permanent alignment.

Every detail has been worked out to attain the utmost reliability for continuous operation of these cranes, draglines and shovels in isolated districts far from dependable transportation. Extreme sturdiness and reliability have been the first considerations.

The use of the anti-friction type of bearing has been worked out to its logical conclusion in the "1030." Every rotating shaft above the deck which operates while the machine is digging, is equipped with self-aligning ball bearings of the finest type, designed with an unusually high factor of safety—about twice what is ordinarily accepted as good practice. This assures smoother operation, and more efficient power transmission.

Perfect alignment is insured by the use of only two bearings on each shaft.

One improvement that is bound to add to the service life of "1030" cranes, draglines and shovels in the field is the ease of lubrication. All high speed gears are enclosed, and run in a bath of oil. The reversing bevel gears and swing gears run in oil, as do the boom hoist, transmission and driving gears of the caterpillar type mounting. Oiling consists of merely checking up on the oil level every week or so.

This saves considerable time that would otherwise be needed to keep the crane, dragline or shovel oiled, and, what is more important, gives definite assurance that the machine will receive proper care.

It is easy for the operator to run the "1030" at high speed. The control levers are easy to handle—operating at a touch. Auxiliary clutches set the large clutches by power. Every control lever—including the control—is where the operator can easily reach it.

For ease in making adjustments, there is a clear passage all around the machinery—on both sides and the rear. The roomy cab gives accessibility to every working part above the deck. Every part of the machinery is easy to get at, without removing any part of the cab or any other part of the machinery. For example the centre pinion is adjustable from the top, and can be removed without any interference whatever from the drum shaft.

The weight of the machinery is placed to the rear of the centre pin—giving the crane and dragline an extra margin of counter-balance for heavy lifting and the shovel more stability in hard digging.

The "1030" is mounted on the latest development of the Bucyrus-Erie "Single Shaft Drive" caterpillar type mounting, which has proved so successful on hundreds of Gas Air and Steam machines.

Steering of this mounting is controlled entirely from the driver's seat, with the cab in any position. Either sharp turns or gradual turns can be made.

The outstanding feature of this mounting is its simplicity—there is only one drive shaft, and one gear and pinion, below the deck. This gear is well up out of the dirt, completely housed and running in oil.

The mounting has the Bucyrus-Erie 2-way brake, which quickly locks the machine in either direction, while permitting free travel the other way. A valuable feature for dragline work, or when working on a grade.

The mounting is also notable for the same easy accessibility that has been worked out in the operating machinery above deck. Any part of the mounting can be taken out without removing any other part.

Detailed information on the "1030" can be had by addressing Bucyrus-Erie Company at South Milwaukee, Wis., U.S.A. or Windsor House, 83 Kingsway, London W. C. 2, England.

Engineering Notes

New Harbor Facilities.—It has been proposed to extend harbor facilities at Newchwang, to afford an outlet for freight transported over the new Chinese lines in Manchuria. A plan is being drawn up to build wharves to berth vessels of various sizes and to construct a new town for railway freight dealers. It is also planned to open an exchange, banks, and trading establishments near the North Side Station. The sum of £50,000 has been appropriated for the immediate improvement of the port. A new bund is to be built along the shore front about two-thirds of a mile in length. All construction work is to be undertaken by the Peking-Mukden Railway.

Road-making by Soldiers in Chekiang.—Chekiang province is now considering the use of 50,000 disbanded soldiers for the construction of roads leading to Anhwei, Fukien, Kiangsu and Kiangsi provinces. As a result of repeated requests from the Nationalist Government, the provincial authorities have decided to build, first, the road from Hangchow to Hweichow, Anhwei province, at the same time sending soldiers to work on the five provincial roads. It is estimated that the materials for the road from Hangchow to Liangchu will cost \$89,804.72. Plans adopted by the provincial authorities will be sent to the Central Government for approval. The Central Government is requested to pay the living expenses of the soldiers as the provincial government is not able to provide funds.

Provincial Road Building.—Reports from Nanchang state that the provincial finance department of Kiangsi has decided to appropriate \$100,000 per month beginning from August for the construction of six main highways in the province: (1) the Kiangsi-Chekiang highway, (2) the Kiangsi-Kwangtung highway, (3) the Kiangsi-Hunan highway, (4) the Kiangsi-Hupei highway, (5) the Kiangsi-Anhwei highway and (6) the Kiangsi-Fukien highway. The reconstruction department of the Anhwei provincial government has also decided to repair and complete the following four trunk roadways in the province: the Wuhu-Tunki, the Anking-Szechow, the Anking-Ningkwu, and the Shucheng-Pochow Highways. It is estimated that the total mileage of the four trunk roads will be 2,590 *li* (860 miles). The programme set out by the highway department of the Chekiang provincial government calls for the construction of the Hangchow-Changhwa and the Hangchow-Hweichow highways. The roads connecting Shaohing and Ningpo, and Ningpo and Fenghua are now under construction and will be completed in the autumn. Various motor roads are also being constructed in and around Hangchow.

Road-Building in Hunan.—For construction of modern highways, Hunan province has been divided into three sections: Central Hunan, Western Hunan, and Southern Hunan, for each of which a Highway Construction Bureau has been organized. Up to the present the Bureau for Central Hunan has achieved most notable results. In 1925 the first section of the provincial highway, from Changsha to Siangtan was completed, and in 1927 the road was extended to Siangsiang. Quite recently the section between Siangsiang and Paoking was completed and opened to motor traffic after an impressive inauguration ceremony held under the auspices of the local officials. Construction is being continued on two new roads: (1) from Paoking to Hungkiang and (2) from Paoking to Yiyang. The roads already constructed in the Central Hunan Section cover a total of 480 *li* or 160 miles.

In Southern Hunan section only the Hengyang-Leiyang Road, about 120 *li* long, has been constructed and in Western Hunan section little has been done owing to lack of funds and other causes. In the former section construction is suspended owing to the activities of the communists. Hunan authorities are starting a "country cleaning" campaign to eliminate the lawless elements, and, at the same time, are taking measures to induce the local inhabitants to co-operate with officials in road-building.

Transportation in Hunan Province.—During the last few years Hunan has paid great attention to transportation, especially motor traffic. Among the motor roads finished are the 90 *li* Chang-Tan road, from Changsha to Siangtan, the 360 *li* Heng-Chen road from Hengchow to Chenchow, the 90 *li* Tan-Siang road from Siangtan to Siangsiang and the 100 *li* Yung-Pao road from Yung-fung to Paoking. The Yung-Pao road was finished last May.

Shanghai-Hankow Aerial Postal Service.—The Nationalist Ministry of Communications intends to appropriate \$100,000 for the opening of an aerial postal service between Shanghai and Hankow. Hydroplanes will be used at first, and each trip will take eight hours.

Tsitsihar-Koshan Railway.—For the construction of the Tsitsihar-Koshan Railway, it is stated that \$6,200,000 has been allocated by the Heilungkiang provincial authorities and that work will start immediately. The first section will be from Tsitsihar to Paichuan, which later will be extended to Koshan.

Commercial Air Line for Canton.—For the encouragement of commercial aerial transportation, the Chamber of Commerce in Canton has drafted proposals to be submitted to the Kwangtung provincial authorities for the purchase of five aeroplanes. The first two will be for four passengers, while later purchases will be for over 10 passengers. The capital to be subscribed is \$200,000 in 10,000 shares of \$20 each. The aeroplanes will begin flying over four routes in the province, but when the project has proved successful the field will be extended.

Highway for Hainan Island.—As the Kwangtung provincial authorities are now deeply interested in the exploration of the undeveloped wealth of the island of Kiungchow or Hainan, it is decided to construct a road of 2,000 *li* round the island, passing through Manyun, Aichow, Tanchow, Cheongkong and Limko. It will take four years to complete and the cost, estimated at more than \$1,000,000, will be defrayed from license fees and a 20 per cent. surtax on motor cars. To prevent misappropriation, all the money will be collected by the Highway Bureau and deposited in the Bank of China at Haichow. Motor cars are now taxed as follows: \$20 on each commercial motor car, \$10 on each private car and \$1 on each motorcycle.

Navigation of Taihu Lake.—Taihu Lake occupies an area of 3,600,000 *mow* and is bounded by Chekiang and Kiangsu provinces. Cities surrounding the lake are prosperous and thickly populated. As industries have developed during the last few years, transportation has improved. But navigation of the lake has never been seriously considered by either the provincial authorities or the business people. Consequent on primitive methods of navigation and the activities of pirates, travelling on the lake is dangerous. In 1922, prominent business men in Wusih, Kiangsu province, organized the Sih Hu Navigation Company, and bought two steamers which are plying between Wusih and Huchow, Chekiang, and are intended to take in Hangchow in the future. Unfortunately, owing to civil wars, the boats were either commandeered by the military or stopped running. Since its organization, the company has never done good business, and, as a result, it went bankrupt last year. The property of the company has been taken over by Yeh Yang-wu, who has now organized the Taihu Lake Navigation Company and who intends to employ experts to take charge of affairs. According to many, the failure of the former company, although partly due to bad business and civil war, was largely the result of bad management. The new company will start business when a permit is received from the Nationalist Government. At present the old lines of the former company will be followed, but, later, boats will run to Hangchow, passing Shwanglin and Kashing.

The Fengtien Cotton Mill.—The Fengtien Cotton Mill in Mukden, Fengtien province, will increase its capital by \$10,000,000 (*fengpiao*), in order to extend its working scope. The mill has been in operation for five years. Its original capital was F. \$4,500,000, divided into 45,000 shares of F. \$100 each, held partly by the provincial Government and partly by private investors. The mill is equipped with 183 yarn twisting machines, 64 spinning machines, 52 roving machines, one sizing machine, 200 weaving machines and 14 hosiery-knitting machines. The total spindlage is 20,000. The mill produces every 24 hours 17,000 pounds of yarn, 230 pieces of cotton cloth of 30 yards each and 30 dozens of cotton socks (only four hosiery knitting machines are operating). Since the beginning of this year, the mill has received more orders for yarn and cloth than it can cope with, and the management has decided to set up a branch factory at Tashihkiao, near both Newchwang and Dairen, to work off the crowded orders. As a temporary expedient, an extension of the mill will be established on the campus of the North-eastern University (which is operating an iron works), Mukden, with 80 weaving machines and one sizing machine to turn out cloth to meet the local demand.

The bulk of the mill's raw cotton is obtained from South Manchuria, where cotton growing is increasing. The local product, however, is still insufficient for the mill, which imports the balance from Chihli and Shansi provinces and the United States. Last year the mill imported 400,000 catties of American cotton. The cotton zone of South Manchuria includes districts north of the Liaotung Peninsula with Liaoyang as the collecting center.

The mill's output consists principally of cotton yarn of 10-to 32-counts, consumed mostly by the small local weaving mills, hosiery knitting plants and band or ribbon weaving mills, of which there are hundreds in the province. These used to get yarn from a Japanese mill at Liaoyang, the Manchuria Cotton Spinning Co., but now prefer the product of the Fengtien Mill, whose yarn of the Shwang Fu brand is particularly popular among the local weavers.

Wireless in Chinese Vessels.—The Ministry of Communications has announced the following regulations governing wireless stations on all Chinese-owned steamships:

1. Wireless stations shall be required on the following steamships: (a) ocean-going steamers of 500 tonnage and upward; (b) all steamers above 300 tonnage having accommodation for 100 passengers or more, plying between places at or more than 130 nautical miles distant from the coast, and covering more than 500 nautical miles each trip; (c) all pilot boats.
2. Steamers not equipped with wireless sets shall not be permitted in Chinese waters without special permission from the Ministry of Communications.
3. All wireless operators shall be Chinese holding certificates from the Ministry of Communications.
4. All wireless stations on steamers shall not interfere with the communication of national (Government) or other public wireless stations.
5. In time of need, the Government may use the wireless stations aboard any steamer for transmitting national or military messages.
6. All steamship wireless stations may charge for private messages according to the International Wireless Regulations.
7. Regulations governing the wave-length and power of wireless sets on steamers shall be decided and announced by the Ministry of Communications.
8. Only those wireless stations on foreign-owned steamers, anchored in Chinese harbors or in Chinese waters, holding certificates from a member-country of the International Wireless League shall be recognized by the Government.
9. All steamers violating Regulation No. 1 shall be prohibited from sailing by the Chinese Maritime Customs.
10. All steamship owners ignoring Regulations No. 2, 3, and 4 shall be fined not less than \$200 and not more than \$2,000 for each count.
11. Men-of-war are not governed by these regulations.
12. These regulations shall be enforced three months after date of promulgation.

Motor Roads in Fukien.—Five motor roads covering a length of about 300 *li* have been completed in or near Chuanchow, Fukien province, while several more are under construction. On the completed roads, motor bus services are being operated. The Chuanchow-Anki road, 55 *li*, with a branch from Tsingyangshih to Shihshih, 15 *li*, was built by the Chuanchow-Anki Motor Road Co. Both roads are macadamized and the bridges and culverts are of cement, concrete or stone. The Chuanchow-Anki road goes part of the way to Amoy. As early as 1913 the promoters of the company raised \$250,000 for the road and work was started in 1919, the road being opened to motor traffic in 1921. Certain sections were built at an enormous cost. The country between Chuanchow City and Tungshan is low-lying and subject to floods, hence this section is much raised. At Lientang and Linkow the ground is hilly and the road has a gradient of 1 in 30. The company is now operating 11 motor buses and 15 five-passenger cars. The distance between Chuanchow and Anki is covered in one hour and 15 minutes including stops, at a fare of \$1 for each passenger. Express cars cover the distance in one hour and charge more. Goods are charged \$9 per 2,000 lbs. The company's monthly receipts average \$18,000 and the expenses \$17,000.

The Chuanchow-Loyangkiao road goes from Chuanchow City to Loyangkiao, 18 *li*, and was built by a private company at a cost of \$23,000. It is 30 feet wide and the surface has a 6-inch layer of sand. The company is operating two buses and two 7-passenger cars, each making about nine round trips daily. The distance is covered in 20 minutes by buses and 15 minutes by express cars. The average daily number of passengers is 150, at 60 cents each for ordinary, and 70 cents for express. Freight is collected at 35 cents per 100 catties. There is, however, little goods traffic. The company's monthly receipts average \$2,900, hardly enough for road maintenance and running expenses.

The road from Hweian, near Chuanchow, to Loyangkiao, is 55 *li* in length and was built by a private company, which operates 10 buses, with average daily receipts of \$60.

The Chuanchow-Yungchun road starts from the West Gate, Chuanchow City, to the South Gate, Yungchun City, having a length of 130 *li*. The road was built with private capital. Construction was started in 1919 and completed in 1926 at a total cost of about \$200,000. The bridges are built of wood and the culverts of stone. A company is operating 30 buses. The round trip takes four hours and each bus makes two trips daily. Fare is 4 cents per *li* and freight, 2.4 cents per 100 catties. The company's monthly receipts are about \$14,000 and the expenses, \$12,000.

The road from Weitow to Chuanchow, 81 *li*, was built by private capitalists, starting in 1923 and, completing up to the present, the section between Weitow and Shihsi, 51 *li* long, at a cost of \$110,000. The Chuanchow-Weitow Motor Bus Co. is operating between Weitow and Shihsi with 12 buses. Each round trip takes about an hour and 20 minutes. The company's monthly receipts are about \$3,500 and the expenses about the same. The unfinished section, from Shihsi to Chuanchow is 30 *li*, and the building will cost \$79,100. The company is raising \$80,000 to continue the work which is expected to be completed in six months. When this section is ready travel between Chuanchow and Amoy will be much facilitated, as launches ply regularly between Weitow and Amoy.

There are three more roads in this neighborhood under construction, the one from Anki to Kiwei, 58 *li*, connecting with several districts south of Chuanchow. It is being built by private capital. The road is 24 feet wide and is expected to be completed in two years. A section will pass through hills at a steep gradient, involving difficult work. The promoters are raising \$250,000 to meet the outlay. After completion motors will be operated at an estimated net yearly profit of \$50,000.

The road from Chuanchow to Siutu, 18 *li*, is being built by a company. The road is 24 feet wide, having ten bridges to be built of wood, and 20 culverts to be stone. The company is raising \$200,000 for the work which is expected to be completed in six months. The company is promoted by the directors of the Chuanchow Ping Ming School, who have invested a part of the school's foundation fund in the enterprise. A Chinese overseas merchant in Manila is interested and undertakes to raise whatever is required. Siutu is a shipping center on the coast, visited by many sea-going junks from Shanghai, Newchwang, Dairen and Hongkong. The building of the road will greatly help the economic development of Chuanchow.

The road from Yashan to Hsingtien is about 11 *li* long and was also built by private capitalists.

To Erect Wireless Station near Shanghai.—To facilitate transmission of Government despatches the Government has decided to erect a wireless station near Shanghai and has appointed Mr. Li Fan-yi to take charge of the construction.

According to Mr. Li, the site of the station will be in the vicinity of either the Shanghai-Nanking or the Shanghai-Hangchow Railway Station. The estimated cost of construction is about \$500,000, and the work will be completed in half a year.—*Kuo Min News Agency.*

Japan to Spend Over \$5,600,000 on Roads.—A comprehensive plan for road improvement and construction for the whole of Japan which contemplates the expenditure of about \$5,689,000 over the next ten years has been formulated by the Civil Engineering Bureau of the Home Department, says the American Automobile Association.

The A. A. A. says the program will extend over a length of 3,600 miles of road.

Daido Denryoku K.K. To Invest in Shikoku.—The Daido Denryoku K.K. (Great Consolidated Electric Power Co., Ltd.) has decided to give financial assistance to the Suhara Suiryoku Denki K.K. in Shikoku. This company belongs to the Yamashita Kisen Kaisha interests, represented by Kamesaburo Yamashita, capitalized at Y.1,000,000. It owns a 6,500 k.w. power station on the Suhara River, and is now planning to develop some 6,000 k.w. more on the same river, and 15,000 k.w. on the Araidai River. Negotiations are now going on between the two companies.

Water Power for Fukien.—Power in Fukien province is costly because the province produces neither oil nor coal, except a limited quantity of anthracite. Both have to be imported at high prices. Attempts have been made by industrialists at Kwantou and Futsing to solve the problem by using producer gas engines with the locally produced anthracite coal as fuel, but the expense proved too great. Fukien being a timber producing province charcoal was also tried but failed to produce cheap power.

Attention is now being turned to water power, and five waterfalls or rapids have been located, those at Lungting, Kutien and at Chiulihu, Siennyu, being pronounced suitable for the purpose. The falls at Lungting have a mean discharge of 2,500 cubic feet per minute in winter, which increases considerably in the rainy seasons. According to the estimate of the Foochow Electric Co., the falls are capable of producing over 100,000 H.P. and the expenses involved in the installation of the plant and other constructive works would cost \$2,500,000. But if some temporary expedient be resorted to, about 10,000 H.P. could be obtained for an outlay of \$1,000,000. The falls are suitably located for construction of dams and other engineering works. Lungting is on the Min River, 60 li above Shuikow and about the same distance below Kutien. The current can be conducted either to Foochow or Yenping, a local commercial and industrial center on the Min River, Lungting being about 200 li (70 miles) distant from either.

The falls or rapids at Chiulihu are 30 li from Siennyu city. The water descends through a bed at a gradient of 1 in 10 and the whole course may be divided into three sections. The mean discharge per minute is 720 cubic feet. It is believed that the rapids are capable of producing enough power not only for Siennyu but also for such neighboring cities as Futsing, Chuanchow and Hinghwa. One of the other three waterfalls is at Kienning and the others in the mountain fastnesses above Kienning. They have not yet been thoroughly investigated but are believed to be of little use industrially owing to their difficult position. At Yungan a water power plant on 200 H.P. has been set up to tap the local waterfalls.

Much attention has also been paid by Fukien officials to this subject. A commission to investigate the question of employing water power for industrial and agricultural enterprises has been organized and reports that power from water can be obtained at half a cent or so per K.W.H., as against 2-3 cents per K.W.H. from coal. With cheap power Fukien industrialists expect to develop the modern paper industry with the local timber. The manufacture of soda and bleaching powder from common salt will also be made possible. Fukien officials are also contemplating the application of water power to the irrigation of farms, and also to saw mills and rice polishing works. Steps are being taken to set up a water power plant by issuing a loan of \$3,000,000.

Fukushima Dento K.K.—(Fukushima Electric Light Co., Ltd.)—It is reported that the Hokuden Kogyo K.K. (Northern Electric Development Co., Ltd.)—a financial organization of the Okawa-Tanaka electric interests—has bought 20,000 shares of the Fukushima Dento K.K. This means that the Hokkaido Dento K.K. intends to make investments in Fukushima through Hokuden and will eventually take over the control of the company. Investigations are now being made as to the financial condition of Fukushima Dento it is reported, and a merger is considered a matter of time.

Oil Fields Discovered in Korea:—The Kogyo Shimbun reports that two oil fields have been discovered in Korea, one at Kaiganmen, near Torai Onsen, in Keisho Nando. A certain Kunita Ito of Fusan has applied for a license for prospecting.

The other is located at Otsuhachimen, Kainei, in Kankyo Hokudo area about 330,000 tsubo, Yaichi Koga has applied for a prospective license.

According to experts, the above districts are rich with coal deposits, and from this fact, the presence of oil is considered to be most probable. The Government General of Korea will send engineers to make investigations. It is reported that these will be the first oil fields to be exploited in Korea.

Shipbuilding Industry.—Subsequent to the government decision to encourage the construction of new superior vessels, by increasing subsidies to appointed steamship lines, the Nippon Yusen Kaisha and Osaka Shosen Kaisha are now building many new vessels, other companies, such as the shipping department of Mitsui and Mitsubishi, Itaya Shosen, Shimaya Kisen, Genkichi Yamamoto, Dairen Kisen, Yamashita Kisen, etc. have similar plans under consideration.

Principal shipbuilding plants in Japan are active with orders from these companies. Profit on the part of builders is comparatively small, it is reported, as orders are taken at a low price. However, idle equipment can be operated at full capacity and the average operating efficiency is expected to improve materially.

Vessels under construction the end of June this year numbered 31 in all Japan, tonnage 107,480 tons, which was an increase of 19 vessels and of 72,000 tons over the end of 1927. Data of the principal plants are reported as follows: (June 30, 1928)

Yokohama Dokku K.K.

One 16,750 ton vessel for San Francisco Line, N.Y.K.

One 3,420 ton vessel for Itaya Shosen

Total five vessels, including small vessels for the Department of Agriculture and Forestry, Osaka Municipality, etc.

Uraga Dokku K.K.

One 2,800 ton vessel, for O.S.K.

One 500 ton vessel, for Yokohama Municipality

Osaka Tekkojo:

Two 5,000 ton vessels for Dairen Kisen

Mitsubishi Zosen K.K.—Kobe Plant:

Two 1,700 ton vessels, O.S.K.

Ditto-Nagasaki Plant:

Two 16,000 ton vessels for N.Y.K., San Francisco Line.

One 5,600 " " " Genkichi Yamamoto

One 6,900 " " " Mitsubishi Shoji K.K.

One 6,150 " " " O.S.K.

Mitsui, Tamatsukuri Zosenjo:

One each 6,500 ton and 2,000 ton vessels, for Mitsui Shipping Department.

One, 5,900 ton vessel for Shimaya Kisen

Orders contracted for and to be contracted in the future include the following: Yokohama Dokku—two 11,000 ton vessels for Seattle Line, N.Y.K., three 5,000 freight vessels for Australia Line, O.S.K. Mitsubishi Nagasaki Plant—two 12,300 ton passenger and freight vessels for N.Y.K., Seattle Line and two or three 7,500 ton vessels for O.S.K., South American Line. Osaka Tekkojo—One 10,000 ton vessel for N.Y.K., West Coast Line, South America, one 11,000 ton also for N. Y. K. for Seattle Line.

The tonnage of these principal vessels alone amounts to some 90,000 tons. Orders placed with Yokohama Dokku, Mitsubishi Nagasaki, Osaka Tekkojo are enough to last for three years, it is reported. When plans of other steamship companies to build diesel engine boats, should materialize, the shipbuilding industry in Japan will assume activities unrecorded since the War Boom.